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Harmonization of Residential & Commercial Mixed-use Developments - Investigation of Regulatory Issues by Case Studies

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Harmonization of Residential & Commercial Mixed-use Developments - Investigation of Regulatory Issues by Case Studies

by

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This Professional Report is dedicated to my husband, parents and siblings

Wen-Yueh

Kuo-Jen & Huei-Ming

Yu-Syuan and Ting-Yang

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Abstract

Harmonization of Residential & Commercial Mixed-use Developments - Investigation of Regulatory Issues by Case Studies

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Mixed-use neighborhoods, which feature increased housing/job variety and density, can create pedestrian and bicycle-friendly environments by reducing dependency on vehicles and traffic congestion, and shortening distances between housing, workplaces and other destinations. Municipal regulations are vital to modern mixed-use developments due to their capability to control the direction of metropolitan growth. In this research, I have attempted to make a correlation between local regulations and current neighborhood development patterns in three well known, mixed-use neighborhoods using the case study approach.

Three mixed-use neighborhoods, the North Pearl District (NPD; Portland, Oregon), South Lake Union (SLU; Seattle, Washington) and False Creek North (FCN; Vancouver, Canada), were chosen for this case study research. I examined and visualized the local regulations that pertain to mixed-use development of each neighborhood using Illustrator and SketchUp. I also analyzed and discussed U.S. Census information, including households per acre, average household size and household vehicle occupancy.

The investigation indicates that among the three neighborhoods, the mixed-use regulations of FCN are the most straightforward and clear. This is reflected in the consistency between regulations and current land uses. The overall mixed degree in NPD is relatively large likely due to its incentive regulations, making itself as a highly walkable neighborhood. The local regulations in SLU are the most complicated, and focus on attracting innovative firms.

In conclusion, we have conducted a study to investigate the development of mixed-use neighborhoods by scrutinizing local regulations and analyzing current situations and statistical data. The results indicated that the straightforward and incentive regulations, such as legalized neighborhood land use plan and bonus floor area ratios, benefit the mixed-use developments of neighborhoods by increasing the efficiency in land use and maximizing the mixed-use degree, thus leading to a compact, walkable and vital community.

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Chapter I. Introduction

1.1. MIXED-USE DEVELOPMENTS BACKGROUND

The term "city" by itself means a rather compact and dense place where support the different functions of a society such as living, working and leisure. Mixed-use developments (MXDs) are shown to be the growth and development patterns of mankind's earliest settlements. MXDs means the communities lived, worked and played together.[1] Lewis Mumford in his article, *What is a City?*,[2] cited John Stow's definition of a **city**: "*... where men by mutual society and companying together, do grow to alliances, commonalities, and corporations."* Therefore, in this definition, "mix" is the fundamental character of urban life.

Although MXDs were the standard pattern of growth until the late 1700's, the Industrial Revolution brought about significant changes to the form of new development. Large numbers of automobiles were manufactured at affordable prices; people started to love driving, to enjoy the modern life style and the auto-oriented development became popular. At the same time, in response to land use conflicts caused by the mixing of residential, commercial and industrial uses, Euclidean zoning was introduced. Euclidian zoning separates residential, commercial and industrial land uses into different zones of the city. This type of zoning and auto-oriented development has gradually shaped cities into segregated, sprawl, and anti-pedestrian places.[3] Segregation and urban sprawl has been identified as contributing to problems such as social and economic inequity, traffic congestion, the loss of urban vitality, environmental pollution, criminal, and even obesity.

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[1] Mark Cooper," Live, Work, Play: Getting Mixed-Use Development Right" May 25 2012, ULI Industry Sectors, http://urbanland.uli.org/Articles/2012/May/CooperMixed (accessed August 15,2012)

[2] Lewis Mumford, "What is a City?" *Architectural Record* LXXXII *(November, 1937)*: 58-62

[3] Jane Jacobs, *The Death and Life of Great American Cities*,(New York: Random House, 1961); Williamson H. Whyte, *The Social Life of Small Urban Spaces*,(D.C.: The Conservation Foundation, 1980)

Beginning in the middle of 20th century, urbanist and author Jane Jacobs questioned the idea of separating land uses. In an effort to address the problems listed above, planning theories such as Smart Growth, New Urbanism, sustainable development, Traditional Neighborhood Development and Transit-oriented Development have also started to re-conceptualize the role of Euclidian Zoning. They believe MXDs could be a way to increase livability, create pedestrian-friendly neighborhoods, reduce auto dependence, help people to live with human scale and live in a sustainable way.

1.2. ISSUES OF MIXED-USE DEVELOPMENTS

MXDs have reappeared on the stage, but since there are still many questions embedded in MXDs, this time we want more than traditional mixed use.

In January 2012, the Taipei city government enforced a ban on The Normal University Night Market (also called Shida Night Market) which prevented it from expanding further, and repressed illegal vendors in order to preserve the "college town" residential character in the area.[4] This crackdown brought out strong resistance from the small local retails or restaurants and also brought out the issue embedded in mixed-use development, the conflicts between different uses.

[4] Taipei Times, Shida expansion ban remains in place, Hau says, Feb 12 2012

Figure 1: The Normal University Night Market

Closed commercial (ground floor) and residential (above 2nd floor) uses. Yellow ribbons to show vendors' determination to comply with government safety regulations. (Source: Taipei Times)[4]

Shida neighborhood is a traditional residential area, developed since Taiwan came under Japanese rule at the beginning of 20th century. From the 1990s, because of the Mandarin Training Center of the Normal University, foreigners have started to live nearby the area and have added exotic atmosphere to the Shida neighborhood where has its own traditional cultural spirit. Since then, character restaurants, coffee shops, and stores, as well as many local food and clothes venders have appeared and thrived in the area. In 2008, due to increased media attention, Shida Night Market became even more popular. From 2009 to 2011, the number of stores increased from two hundred to seven hundred. Due to the pressure of expansion, those stores have spread into smaller alleys,

and severely disturb the daily life of local residents with their noise, odors and the issues with public safety.[5]

In order to protect the rights of residents and the college town character, the Taipei Government has started to enforce the law in the area. For example, "Taipei Deputy Mayor Chen Hsiung-Wen said part of the night market is classified as a residential zone and, according to land-use regulations, roads less than 8 meters wide in residential zones cannot be used for commercial purposes."[6] Some opponents argue that strong interference from government may kill the hard-grow shopping district and the local character, and; citizens and tourists regret losing an interesting place to go. However, the residents appreciate the better living environment.[7] This crackdown brought out the core issue of MXDs: the conflicts between commercial uses and residential uses, between the vital urban space and tranquil neighborhood.

In an example in the United States, in Austin, Texas, the local government has created incentives for many new vertical mixed-use projects. In Austin, the vertical mixed-use or mixed-use projects are regulated by the "Subchapter E. Design Standards and Mixed Use." The mixed-use projects meet the requirement of the Subchapter E. and can have development bonuses such as no maximum floor area ratio, no maximum building coverage and so on.[8] These codes encourage constructors to build mixed-use buildings. However, while the city can promote MXDs by codes and regulations, they can't control or predict the private market trends. For instance, there are many vacant

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5 Wikipedia, "Shida Night Market", http://zh.wikipedia.org/wiki/%E5%B8%AB%E5%A4%A7%E5%A4%9C%E5%B8%82 (accessed September 15,2012)

6 Taipei Times, Shida expansion ban remains in place, Hau says, Feb 12 2012

7 Nai-Jie Lou, "Shida Night Markets and its neighbors" October 27 2011, Coolloud Organization, http://www.coolloud.org.tw/node/64696?page=1 (accessed September 15,2012)

8 City of Austin, Municipal Code, "Subchapter E: Design Standards and Mixed Use sub-chapter of the Land Development Code," (Austin TX: City of Austin, 2009)

shops for rent in those new mixed-use projects in Austin. The commercial and residential uses of MXDs ought to complement the function of each other, but, in reality, sometime this goal is not so easy to reach.

1.3. RESEARCH QUESTION AND ANTICIPATED FINDINGS

Although there are many regulations and codes regarding to MXDs, many issues remain to be answered. In addition, I think government regulations will be more influential in shaping cities than developers or citizens.[9] Therefore, this Professional Report (PR) will discuss how to improve MXDs from a regulatory perspective. I believe, when carefully arranged, commercial and residential uses can complement each other better: residents will enjoy the convenience of proximity to work and retail opportunities, shops will enjoy a steady stream of people, and all of the citizens will enjoy a more energetic and flexible city.

The following question will be addressed in this report:

What are some regulations or policies that can be used to improve the design of mixed use developments?

In this study, the relationship between different uses within MXDs will be discussed thoroughly to provide fundamental information for researching the regulatory questions of MXDs. And, by the case studies of MXDs best practices, the good MXDs codes and regulations will be discussed and developed.

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[9] Shawn T. Conrad, Successful urban mixed-use development: A cautionary tale of two cities (Ph. D. diss., Arizona State University, 2010)

Chapter II: Mixed-use Developments and Their Regulatory Issues

In this PR, I will begin with a literature review to clarify the meaning and issues related to MXDs and their regulatory issues. The following topics will be discussed: 1) the definition of mixed-use developments; 2) advantages and issues of mixed-use developments; 3) regulatory issues related to mixed-use developments; 4) regulatory backgrounds of case study cities.

2.1 MIXED-USE DEVELOPMENTS DEFINITION

The concept of mixed-use is ambiguous.[10] Andy Coupland in the first chapter of his book: *Reclaiming the City- Mixed use development* describes mixed-use development as a jigsaw puzzle: different proponents have different points of view about mixed-use development, like pieces in the jigsaw puzzle.[11] Therefore, before starting to consider how to improve MXDs, discussing mixed-use development from multiple perspectives is critical for getting a clear picture of mixed-use development. Generally, the definition of MXDs can be discussed by what the mix should consist of and by the scope of the development. I will discuss these issues in the following paragraphs, after the history and background section.

2.1.1. History and Background of Mixed-use Developments

In the history of urbanization, mixed uses were not an exception, but the dominant fashion of land use. According to Coupland and Schwanke, before the middle of nineteenth century, the mixing of different land uses: residential, commercial, entertainment, lodging, civic and so on, in a specific area were the normal land use

[10] Alan Rowley, "Mixed-use Development: ambiguous concept, simplistic analysis and wishful thinking?" Planning Practice and Research, Vol.11, No.1, P.85-97, 1996

[11] Andy Coupland, *Reclaiming the city : mixed use development* (London: Chapman & Hall, 1998)

pattern in both small villages and large cities.[12] They further point out that mixed use development has historically been popular throughout the world, from ancient towns and cities in Greek and China, to medieval Europe, to the mixed-use buildings built centuries ago and endure today in London, Paris, Cairo and many Asian cities.[13]

Several factors contribute to the long-standing popularity of mixed-use developments. One of them was the need for defensibility. For example, during the medieval period, in many urban areas, walls or ramparts were built around from outside threats. These walls also served as development constraints, resulting in compact growth with a variety of uses within the boundary.[14] Also, due to the high cost of water-borne or animal-drawn transportation, these cities were pedestrian friendly. By the thirteenth century, towns and cities began to be developed without walls, or, occasionally, with new ramparts built beyond the limits of the old one. With the less restricted style, the compact and mixed-use characters of cities weren't diminished, but were intensified. The improvement of technology in the period enabled specialization; this promoted trading and economic activity, and therefore improved the cultural, political and religious activities in these cities.[15] These various activities enriched the functions of those cities. As the author Schwanke said, "compactness, density and mixed uses were the hallmarks of those cities before modern ages."[16]

Although mixed-use development was popular and even necessary throughout history, this trend shifted dramatically during the Industrial Revolution and the early twentieth century. After the Industrial Revolution, segregation of different land uses

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12 Andy Coupland, *Reclaiming the city : mixed use development* (London: Chapman & Hall, 1998), P.30; Dean Schwanke, Mixed use development handbook (Washington D.C.: Urban Land Institute, 2008), P.3

13 Ibid

14 Andy Coupland, *Reclaiming the city : mixed use development* (London: Chapman & Hall, 1998), P.32; Dean Schwanke, Mixed use development handbook (Washington D.C.: Urban Land Institute, 2008), P.9

15 Ibid

16 Dean Schwanke, Mixed use development handbook (Washington D.C.: Urban Land Institute, 2008), P.9

became more prevalent. According to Coupland and Schwanky, there were three reasons contributing to this change: 1) the rise of the automobile, 2) growing affluence, 3) and the implementation of land use regulations and zoning laws.[17] All of these were related to the Industrial Revolution: massive production of cars became possible, there was rapid economic growth and increased public wealth, and an expansion in land use conflicts. It is these land use conflicts, or nuisances, which resulted in the birth of zoning in 1916 in New York.[18] In addition, Hoppenbrouwer, et al. point out the influence from the international movement of Congrès internationaux d'architecture moderne (CIAM): *"Since World War II, town planning in many European and North American cities has been considerably influenced by the principles of functionalism [...] CIAM advocated the 'Functional City' in which the four main functions of the city (housing, employment, recreation and transport) were clearly separated."*[19]

Resulting from those factors, and influenced by Ebenezer Howard's idea of Garden City, the housing development trends in this period reinforced the popularity of suburbanization and single land use living style. Clarence Perry's neighborhood unit concept was a good example.[20] This design introduced single use super block for residential and separated traffic modes to accommodate the increasing use of automobiles. The design brought about new housing styles; at the same time, it was a totally different development trend from traditional mixed use. By the 1930s, the single use development patterns had become the major investment type, and it was almost

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[17] Dean Schwanke, Mixed use development handbook (Washington D.C.: Urban Land Institute, 2008), P.3; Andy Coupland, *Reclaiming the city : mixed use development* (London: Chapman & Hall, 1998), P.40-43

[18] Andy Coupland, *Reclaiming the city : mixed use development* (London: Chapman & Hall, 1998), P.40-41

[19] Hoppenbrouwer, Eric and Louw, Erik, "Mixed-use Development: Theory and Practice in Amsterdam's Easten Docklands," Routledge:, European Planning Studies, October 2005, Vol. 13, No.7, P.967

[20] Andy Coupland, *Reclaiming the city : mixed use development* (London: Chapman & Hall, 1998), P.53

completely without any reference to other uses or the overall plan.[21] This trend of suburbanization and single use development has contributed to traffic congestion, environmental problems, the loss of urban vitality, social and economic inequity, crime and obesity.

In this paragraph, I am going to briefly talk about MXD trends after the 1960s in the U.S, the modern era of mixed use (Table 1). In the 1960s, the first large-scale mixed-use towers emerged. Many of these projects reflect an international architecture style: the glass-box buildings. Although, the 1960's mixed use projects were more open than those in the 1970s, the international style did not prioritize the space outside of the buildings. This resulted in poor open space for pedestrians. The other mixed-use development trend of this period was the cooperation between public and private sectors for revitalizing downtown commercial cores. This public-private cooperation showed governments' interests in creating more mixed places. The mixed use development projects in the 1960's were more residentially orientated. For example, many of the projects began as primarily residential projects. In contrast with the development during the 60s, in the 1970s mixed use projects focused primarily on commercial uses. For instance, the mixed uses of retail, office and hotel, were affected by the design of shopping malls. Mixed-use projects in this age were enclosed, and oriented to the inside with large interior atriums. Although this trend of turning their back on the surrounding city received strong criticisms, these developments of the 1970's brought the mixed use concept to a broader scale. The 1980s saw the growing application of postmodern architecture design, urban design and the historical theme. Mixed-use projects in this decade started to focus on spaces between buildings and take into consideration the original urban structures. The other trends in the 1980s were the growth in number of

[21] Andy Coupland, *Reclaiming the city : mixed use development* (London: Chapman & Hall, 1998), P.53

mixed-use projects developed in the suburbs, a return to residential focus, and growing acceptance of mixed-use project in small-scale environments. The 1990s witnessed the continued evolution of the trend in the 1980s: a transformation of mixed-use development from project focus to place making and from mega structures to urban districts.[22]

Furthermore, Hoppenbrouwer summed-up the modern mixed-use trend geographically: "in Europe mixed-use is commonly seen as part of an urban renaissance or the compact city concept and in the US as part of the so-called New Urbanism strategy."[23]

Eras	Mixed-use Trend	MXDs' Urban Design Trend
1960s	• large-scale mixed-use towers • international architecture style • residential orientated	• no attention on the space outside buildings
1970s	• commercial orientated, affected by the design of shopping mall	• enclosed and internal orientation with large interior atriums, turning their back on the surrounding city
1980s	• postmodern architecture design, urban design and the historical theme • suburbs projects • residential orientated	• took consideration of spaces between buildings and original urban structures
1990s and after	• urban districts	• place making

Table 1: Mixed-use Trends in Modern Eras

2.1.2. The Components of Mixed Use Projects

A mixed-use development, in general, means a development project which integrates different kinds of uses, such as residential, retail, office, hotel, theater and so on. At the same time, they usually have pedestrian-oriented design, a certain percentage

[22] Dean Schwanke, Mixed use development handbook (Washington D.C.: Urban Land Institute, 2008), P.12-22

[23] Eric Hoppenbrouwer and Erik Louw, "Mixed-use Development: Theory and Practice in Amsterdam's Eas ten Docklands," (Routledge: European Planning Studies, October 2005, Vol. 13, No.7),968

of affordable housing (mixed income), and different housing choices (mixed housing types). The followings are key components of MXD defined by different entities.

In the *Mixed-Used Development Handbook,* Urban Land Institute (ULI), characterizes a mixed-used project as including the following three components:[24]

1) more than three major uses in well planned projects are mutually supporting;

2) significant physical and functional ***integration*** of project components (and thus a relatively close-knit and intensive use of land), including uninterrupted ***pedestrian connections***;

3) development in ***conformance*** with coherent plan (that frequently stipulates the type and scale of uses, permitted densities, and related items).

The other often quoted definition of mixed use, was developed by a cross-organizational survey endorsed by the Building Owners and Managers Association International, the International Council of Shopping Centers, the National Association of Industrial and Office Properties, and the National Multi Housing Council. It suggests that a mixed-use project should have these characteristics:[25]

1) a mixed-use development is a real estate project with planned integration of ***some*** combination of retail, office, residential, hotel, recreation or other functions;

2) it is ***pedestrian-oriented***;

3) it contains elements of a ***live-work-play*** environment;

4) it maximizes space usage, has amenities and architectural expression,

5) it tends to mitigate traffic and sprawl.

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[24] Dean Schwanke, Mixed use development handbook (Washington D.C.: Urban Land Institute, 2008), 4-6

[25] Michael P. Niemira, , "The Concept and Drivers of Mixed-Use Development: Insights from a Cross-Organizational Membership Survey," Research Review, Vol.14, No.1, 2007

Furthermore, from a more conceptual points of view, Grant points out three levels of mixing of mixed-use development:[26]

1) the first level is mixed-use developments should increase the *intensity* of land uses; for example, planners may enhance the range of housing choices available within a given category of land use which can serve households in different life-cycle stage and then increase social mix;

2) the second level of mixing involves increasing the *diversity* of uses within the urban fabric by encouraging a compatible mix;

3) the third level of mixing is integrating segregated uses and it is about overcoming regulatory barriers which mostly related to environmental impacts. Here, Grant emphases that *"while integrating some segregated uses may prove desirable and possible, the term compatible recognizes that not all uses mix well."*[27]

By Grant's three-level category of mixed use development, Hoppenbrower and Louw conclude that the three conceptual levels reveal the ambiguity of mixed use development; it can refer to various contexts, including *environmental, social, design and institutional*.[28]

In sum, a mixed-use project is generally considered to have both physical and functional integrated uses. One difference between these different definitions of MXDs is the minimum number of different "uses" in a project. The minimum number of uses required to constitute a mixed use project is three in ULI's designation; other definitions don't specify the number of uses. Jane Jacob, in her book The Death and Life of Great

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26 Jill Grant, "Mixed Use in Theory and Practice- Canadian Experience with Implanting a Planning Principle ," APA Journal, Winter 2002, Vol.68, No.1

27 Jill Grant, "Mixed Use in Theory and Practice- Canadian Experience with Implanting a Planning Principle ," APA Journal, Winter 2002, Vol.68, No.1, P.73

28 Eric Hoppenbrouwer and Erik Louw, "Mixed-use Development: Theory and Practice in Amsterdam's Easten Docklands," Routledge:, European Planning Studies, October 2005, Vol. 13, No.7, P.968

American Cities, points out that to support diversity and street vitality during different times of a day, there should be at least two "primary uses" (residential and major employment or service functions) plus other kinds of secondary uses (shops, restaurants) to provide services for supporting the demand from the primary uses.[29] She emphases "if this secondary diversity serves single primary uses, no matter what the type of use, it is innately inefficient."[30] Therefore, we may conclude that three different kinds of uses (including two primary uses) essential components of mixed use developments. I summarize the essential components of mixed use development in the following:

1) a minimum of three different kind of uses (including two primary uses);

2) intense land uses;

3) providing diverse choices within a primary use, especially providing various housing choices to support social and economic mixed;

4) physically and functionally integrated within those uses and surrounding context;

5) pedestrian oriented design.

2.1.3. Scale and Dimension of Mixed-use Developments

The scale and dimension of mixed use should be categorized and clarified for the better understanding of how the different land uses mixed in MXDs. In substance, mixed use ranges from a unit (live/work), a building (vertical mixed-use), a block, a neighborhood to a city. The followings are different scales and dimensions of mixed use.

[29] Jane Jacobs, "The Death and Life of Great American Cities," 1961
[30] Ibid

Since all places are mixed at town or city scale, Rowley puts aside the town- and city-wide mixing. The other scales mixing according to Rowley's definition are:[31]

1) within districts or neighborhoods;

2) within the street and other public spaces;

3) within building or street blocks;

4) within individual buildings.

Rowley also points out four types of locations for mixed use:[32]

1) city or town centers comprising the commercial and civic core of towns and cities;

2) inner-city areas and brownfield sites comprising derelict, vacant or built-up land needing regeneration;

3) suburban or edge-of-town locations;

4) greenfield locations where planning policy permits.

In ULI's categories, there are three scales of mixed use project, ranging from highest density to lowest density:[33]

1) **mixed-use towers** are a single structure typically of considerable mass and height, whose uses principally are layered vertically;

2) **integrated multitower or multicomponent structures** which include individual buildings and towers architecturally connected by a common atrium, concourse, shopping complex, and/or underground parking structure that integrates all or most of the project components at the lower levels in a common base;

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[31] Alan Rowley, , "Mixed-use Development: ambiguous concept, simplistic analysis and wishful thinking?" Planning Practice and Research, Vol.11, No.1, P.85-97, 1996

[32] Ibid

[33] Dean Schwanke, Mixed use development handbook (Washington D.C.: Urban Land Institute, 2008), P.6-8

3) **mixed-use town centers, urban villages and districts**, they are low- or mid-rise buildings organized around streets, parks, plazas and/or squares and function like an urban district more than a single project.

Finally, Hoppenbrower and Louw offer an integrated discussion about the scale and dimension of mixed use development. They notably bring the "time dimension" into the discussion: *"the dimension of time refers to the fulfillment of multiple functions within a certain time-period: an hour, 24 hours, week, month, season, year, etc."* The followings are the mixed use dimensions presented by Hoppenbrower and Louw[34] (Table 2 and Figure 2):

1) **Shared premises dimension** basically refers to multifunctional use at a particular point. Live-work spaces is the typical example of shared premises dimension. This dimension occurs on a building or a unit scale.

2) **Horizontal dimension**, in this dimension land uses are mixed horizontally, between buildings on street level. This dimension may occur on a block, district or city scale.

3) **Vertical dimension**, land uses are often vertically mixed by building two of more functions above each other in this dimension. Housing located over shops are the well-known example. This dimension occurs on a building or block scale.

4) **Time dimension**, a particular space is used by more than one functions in different time. This kind of dimension occurs on building or block scales.

Dimension	Building	Block	District	City
Shared Premises	√			
Horizontal		√	√	√
Vertical	√	√		
Time	√	√		

Table 2: Components of Mixed Land Use: Dimensions versus Scale[35]

[34] Eric Hoppenbrouwer and Erik Louw, "Mixed-use Development: Theory and Practice in Amsterdam's Easten Docklands," (Routledge:, European Planning Studies, October 2005, Vol. 13, No.7), 970-974

[35] Eric Hoppenbrouwer and Erik Louw, "Mixed-use Development: Theory and Practice in Amsterdam's Easten Docklands," Routledge:, European Planning Studies, October 2005, Vol. 13, No.7, P. 974

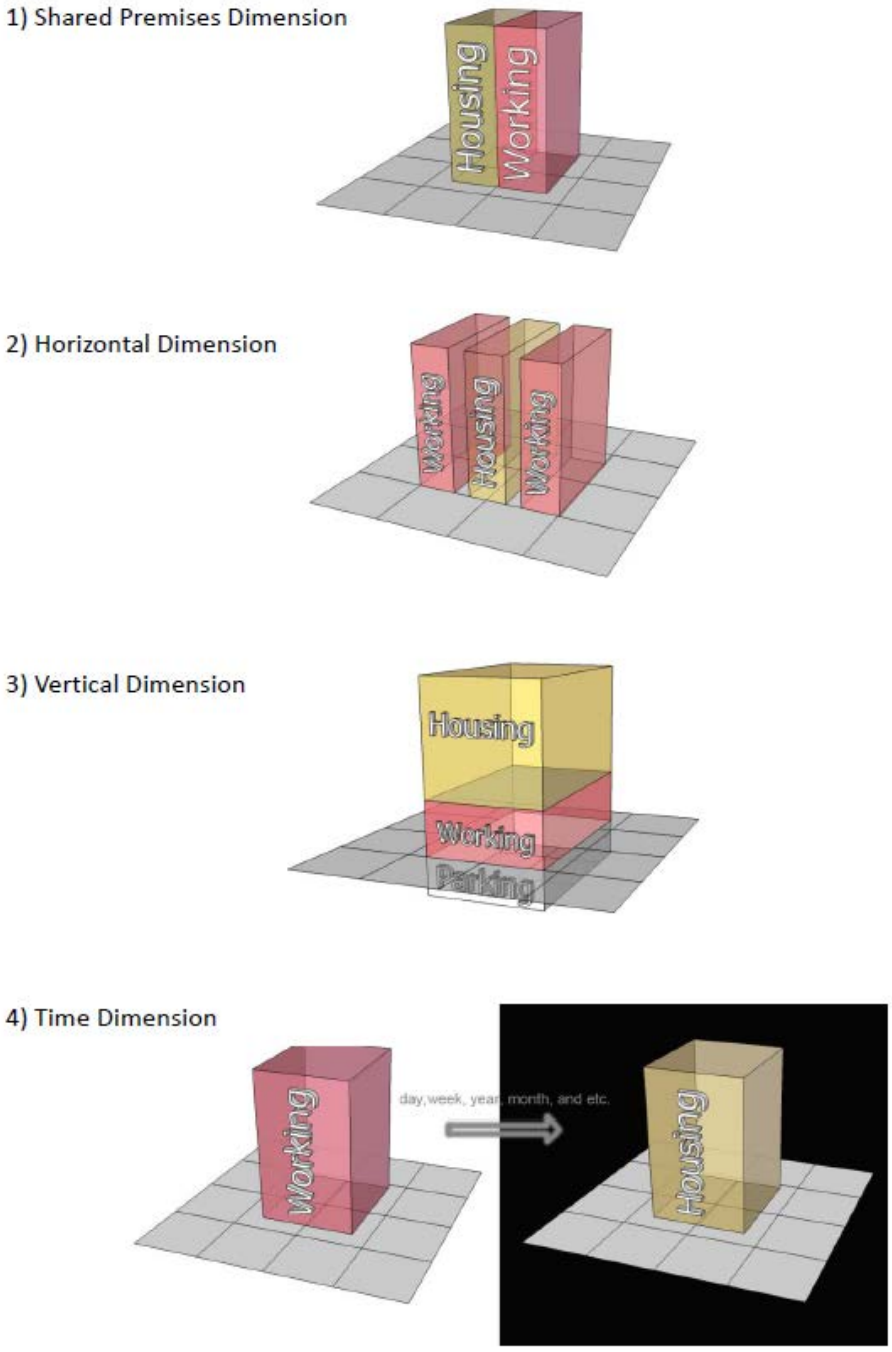

Figure 2: Dimensions of MXDs[36]

[36] Eric Hoppenbrouwer and Erik Louw, "Mixed-use Development: Theory and Practice in Amsterdam's Easten Docklands," Routledge:, European Planning Studies, October 2005, Vol. 13, No.7, P. 973

In this section, I introduce three sets of scales and dimensions of MXDs. First, Rowley[37] puts more focus on the horizontal dimension and the different kinds of locations of mixed-use development. Second, ULI's category[38] is from a more design and developer-oriented point of view. Thirdly, Hoppenbrower and Louw[39] think of dimension and scale jointly, and mention the dimension of time within MXDs.

In addition to the function and design of MXDs, all of the categories remind us that the basic physical dimension, scale and location should be taken into account while we are discussing the issue of mixed-use spaces. For example, different literatures refer to mixed-use development in different scales: Jacobs refers to mixed-use at the neighborhood scale, while Coupland refers to the scale of a building-complex, and Grant discusses the local scale.[40]

2.1.4.Conclusion

Although MXDs are not new products of the modern era, the revival of developing of MXDs in recent decades has given MXDs a new meaning. From this discussion of MXDs' components, we can see there are various ways to mix land uses at different scales and dimensions. The discussion in this section provided background information for my research question.

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[37] Alan Rowley, "Mixed-use Development: am bigous concept, simplistic analysis and wishful thinking?" Planning Practice and Research, Vol.11, No.1, P.85-97, 1996

[38] Dean Schwanke, Mixed use development handbook (Washington D.C.: Urban Land Institute, 2008),6-8

[39] Eric Hoppenbrouwer and Erik Louw, "Mixed-use Development: Theory and Practice in Amsterdam's Easten Docklands," Routledge:, European Planning Studies, October 2005, Vol. 13, No.7, P.970-974

[40] Eric Hoppenbrouwer, and Erik Louw, "Mixed-use Development: Theory and Practice in Amsterdam's Easten Docklands," Routledge:, European Planning Studies, October 2005, Vol. 13, No.7, P.971

2.2. THE RELATIONSHIP BETWEEN RESIDENTIAL AND COMMERCIAL USES IN MXDS

MXDs can be formed by various mixtures of uses. The combination of residential and commercial is the most typical type of MXDs; these also affect each other the most, in both positive and negative ways.

The case of The Normal University Night Market mentioned in Chapter I as well as my childhood experience demonstrate the benefits and the conflictions of residential and commercial mixed uses. I grew up in a highly mixed-use building. The building had 10 floors: 1st to 4th floor were retail stores for clothes and accessories, 5th floor a karaoke place, 6th floor a pub and 7th to 10th floor storage and residential uses. My family lived in one of the units on the 9th floor, and my mother operated her clothing store at the 1st floor. Thanks to the close proximity of these different uses, my mother was able to take care of me and run her own business. At the same time, I was also able to play with other stores' kids in the building. It provided a safe and playful environment for me and my friends while allowing our parents to work and raise children at the same time. It was safe because every store knew each other and we were playing under the eyes of those grownups; it was playful because the various pathways between the stores created an interesting physical environment for children. However, there were some basic problems in this kind of mixed-use environment. For example, stores, karaoke, pub, storage and residential shared the same circulation area and they were very close to each other. Because of this, I usually smelled the odor of alcohol when I was playing around the building and was distracted by noise when I was doing my homework.

From the examples of my childhood experience and the case of The Normal University Night Market, we can observe both positive and negative effects between residential and commercial uses in MXDs. In the following paragraphs, I am going to discuss these inherent issues and advantages of MXDs.

2.2.1. The Advantages of Mixed Use Development

Since the advantages of MXDs are usually interrelated, Copland structures the benefits of MXDs into the following categories (Figure 3).[41] According to Copland, MXDs can ensure vitality in spaces by encouraging activity and diversity of land uses. This vitality can make area safer at the same time. It is also helpful for creating attractive and better quality town centers. On the other hand, MXDs also convey environmental benefits by reducing the need to travel and making people less reliant on cars. As a result, society, the economy and the environment can simultaneously benefit from MXDs.

For the discussion in the book, Copland further organizes the advantages of MXDs into the categories of definite advantages and possible advantages. The definite advantages of MXDs are: 1) attractiveness and vitality-diversity; up to 24-hour city; 2) uses unwanted or obsolete property; 3) range of uses means greater likelihood of some parts lease. The possible advantages are: 1) reduction in travel (shorter trips, more multi-functional trips), and so reduced emissions; 2) increased sustainability; 3) others such as reduction in crime; more activity; greater uses and eyes on the street.[42]

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[41] Andy Coupland, *Reclaiming the city : mixed use development* (London: Chapman & Hall, 1998), 3 (originally: Depart of Environment in England, 1995)
[42] Ibid, 4

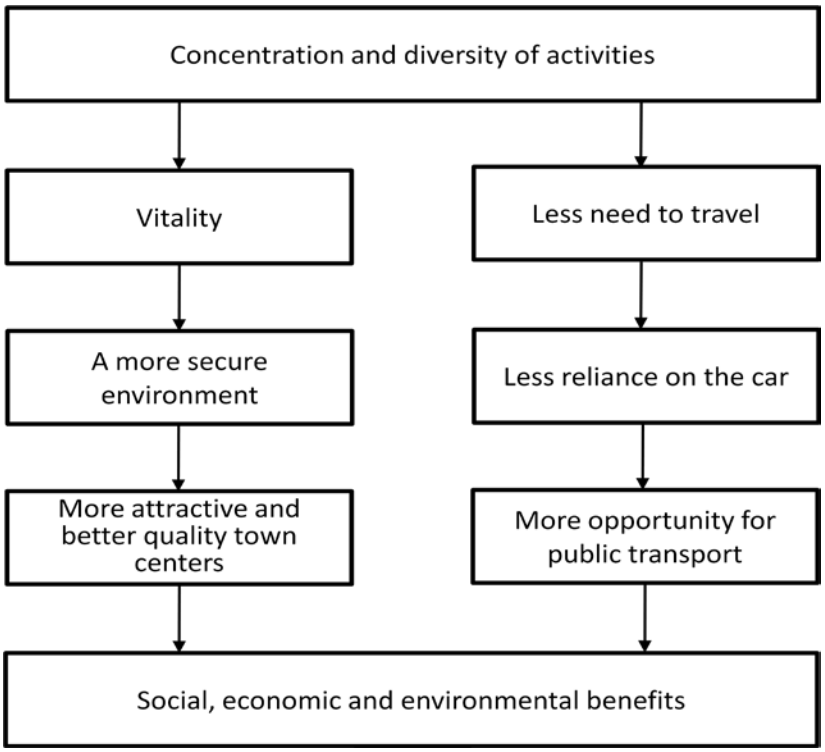

Figure 3: Benefits of MXDs[43]

In the chapter of Neighborhood Pattern and Design of *A Citizen's Guide to LEED for Neighborhood Development* (LEED-ND)[44], Aaron Welch, Kaid Benfield and Matt Raimi point out mixing residential, commercial and live-work uses is beneficial from many aspects. First of all, the diverse uses can support each other and reinforce the neighborhood character. Additionally, because of the spatial proximity of different uses, the need to travel long distances for goods, services, or work may decrease. In addition, a neighborhood with a wide range of housing types and sizes can support a diverse population; this enhances the stability of neighborhoods by allowing people to stay in the same community in different stages of their lives. It can also improve social

[43] Andy Coupland, *Reclaiming the city : mixed use development* (London: Chapman & Hall, 1998), 4
[44] Aaron Welch, Kaid Benfield and Matt Raimi , *A Citizen's Guide to LEED for Neighborhood Development* (Green Building Council, Natural Resources Defense Council, and the Congress for the New Urbanism),9

and economic diversity with multiple levels of affordability. *"When housing is available at an affordable range of prices, people who earn less but are vital parts of any community- such as teachers, police officers and public sector employees, or artists-can live and work in the same community as those with higher incomes."*[45] In this way, economic opportunity and society are improved while commute times are reduced.[46]

These two synthetic discussions (Coupland and LEED-ND) show the interactive advantages of MXDs. In the following paragraphs, I am going to discuss detailed benefits of MXDs with a broader literature review; some of them are mentioned by Coupland or LEED-ND, some of them are not. Here is a list of those benefits: 1) reducing travel time to work, 2) public transportation and pedestrian oriented, 3) improving economic opportunities and keeping the community vibrant, 4) enhancing urban vitality, 5) providing social and economic supports to families, 6) making streets safer.

1) Reducing Travel Time to Work and Other Activities

So while Coupland and LEED-ND recognize that decreasing the need to travel is one of the benefits of MXDs, Hoppenbrouwer et al. point out the first general reason of promoting MXDs is to reduce the need to travel by providing daily requirements in close proximity.[47] *"A concentration of activities makes the integration of activities possible, while at the same time providing for a combination of potential traffic flows between these concentrations based on the application of efficient traffic systems."*[48]

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[45] Aaron Welch, Kaid Benfield and Matt Raimi , *A Citizen's Guide to LEED for Neighborhood Development* (Green Building Council, Natural Resources Defense Council, and the Congress for the New Urbanism),9

[46] Ibid

[47] Eric Hoppenbrouwe, and Erik Louw, "Mixed-use Development: Theory and Practice in Amsterdam's Easten Docklands," Routledge:, European Planning Studies, October 2005, Vol. 13, No.7, P.968

[48] Eric Hoppenbrouwer and Erik Louw, "Mixed-use Development: Theory and Practice in Amsterdam's Easten Docklands," Routledge:, European Planning Studies, October 2005, Vol. 13, No.7, P.968; Originally

Jane Jacobs also indicates that concentrated diversity of land uses is critical for reducing the uses of vehicles and saving the spaces for roads or parking, especially where the populations are dense.[49] *"Lack of wide ranges of concentrated diversity can put people into automobiles for almost all their needs. The spaces required for roads and for parking spread everything out still farther, and lead to still greater uses of vehicles. This is tolerable where the population is thinly spread. It becomes an intolerable condition, destructive of all other values and all other aspects of convenience, where populations are heavy or continuous."*[50]

2) Public Transportation and Pedestrian Oriented Environemnts

Because of MXDs usually using land intensively, those residential and commercial uses can support increased urban density and, furthermore, generate efficient ridership for public transportation.[51] This kind of dense and diversified city *environment will encourage people's walking behavior: "The more intensely various and close-grained the diversity in an area, the more walking. Even people who come into a lively, diverse area from outside, whether by car or by public transportation, walk when they get there."*[52]

Pedestrian oriented environments are not only the result of MXDs, they are also an essential factor of MXDs. Including live-work spaces in the same building or same place is one type of MXDs. However, those live-workers are easily isolated on the workdays, so the opportunities of casual interactions that build a sense of community are

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in Priemus, H., Nijkamp, P. & Dieleman, F. (2000) Meervoudig ruimtegebruik; Stimulansen en belemmeringen (Delft: Delft University Press).

49 Jane Jacobs, *The Death and Life of Great American Cities*,(New York: Random House, 1961), 230

50 Ibid

51 Howard Davis, *Living Over the Store: Architecture and Local Urban Life*, (New York: Routledge, 2012), 7

52 Jane Jacobs, *The Death and Life of Great American Cities*,(New York: Random House, 1961), 230

important for them. Those interactions can be provided by the individual live-work development project and by pedestrian oriented design in the neighborhood.[53]

3) Improving Economic Opportunities for the Neighborhood, the Developer and the City

Davis uses some examples to explain how MXDs can maximize the economic opportunity for a community: New York has apartment houses in which shops and doctors' offices are directly connected to apartments. Hong Kong has shophouses that were subdivided to allow independent families to live above them. *"There is a continuum of relationships between the traditional, family shop/house and the building with independent apartments and shops."*[54] He thinks this continuum exists because people use buildings flexibly, which can maximize the economic opportunity for them.[55] Dolan also thinks the live-work type MXD in a neighborhood helps build strong communities that are able to learn and adapt over time, and remain vibrant.[56] I think those benefits cannot exist without diverse social groups, such as mixed income groups and mixed household types. Talen, in her book Design for diversity, mentioned "mixing population groups is the ultimate basis of a better, more creative, more tolerant, more peaceful and stable world."[57]

From a private market perspective, MXDs improve the economic opportunities for both of commercial and residential developers as well. MXDs provide residents with convenience, while helping to provide a market for the retailer that "can 'count

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53 Thomas Dolan, *Live-Work Planning and Design: Zero-Commute Housing*,(New Jersey: Wiley, 2012), 95

54 Howard Davis, *Living Over the Store: Architecture and Local Urban Life*, (New York: Routledge, 2012), 3

55 Ibid

56 Thomas Dolan, Live-Work Planning and Design: Zero-Commute Housing,(New Jersey: Wiley, 2012), 109

57 Emily Talen, *Design for Diversity- Exploring Socially Mixed Neighborhoods*, (Oxford, UK: Architectural Press, 2008), 40

rooftops' by looking up at its own roof."[58] Besides the mutual benefits for residential and commercial uses, MXDs can reduce the financial risk to the developers since the multiple product types may be less susceptible to market fluctuations.[59]

From municipalities' point of view, mixed-use developments can generate positive fiscal impacts.[60] For example, when considering the taxes and expenditures for MXDs, usually the taxes of the mixed-use zones or projects exceed the expenditures of them. Minicozzi uses Asheville, North Carolina as an example: a typical acre of mixed-use downtown Asheville generates $360,000 more in tax revenue (more than 800%) to the city than an acre of strip malls or big box stores.[61]

4) Enhancing Urban Vitality (by Creating Both Day and Night Uses)

The other well-recognized benefits of MXDs is enhancing urban vitality. Hoppenbrouwer and el. think MXDs can offer opportunities to improve the quality and attractiveness of a community by, for example, increasing the activity during the day, in the evening and at weekends.[62] In this way Davis states that the commercial or residential uses of MXDs help to support diversity of neighborhood life.[63]

Jacobs emphasizes that for successful city streets, we must ensure "the presence of people who go outdoors on different schedules and are in the place for different

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58 Sheldon A. Halpern and Steven P. Heller, "MIXED-USE PROJECTS: DOCUMENT AND DEVELOPMENT", (Pircher, Nichols & Meeks, the Real Estate Law Firm: 2004) http://www.pircher.com/resources/article.php?i=310 (Retrived: 2012 December,29)

59 Ibid

60 Mary M. Edwards and Jack R. Huddleston, "Prospects and Perils of Fiscal Impact Analysis" (Journal of the American Planning Association, Winter 2010, Vol. 76, No. 1),31

61 Joseph Minicozzi, " The Smart Math of Mixed-Use Development" (Planetizen, 2012) http://www.planetizen.com/node/53922 (Retrived: 2012 December,29)

62 Hoppenbrouwer, Eric and Louw, Erik, "Mixed-use Development: Theory and Practice in Amsterdam's Easten Docklands," Routledge:, European Planning Studies, October 2005, Vol. 13, No.7, P.968

63 Howard Davis, *Living Over the Store: Architecture and Local Urban Life*, (New York: Routledge, 2012), 7

purposes, but who are able to use many facilities in common."[64] Furthermore, if we intend to generate diversity and vitality for urban spaces, we must make sure the mixture of uses is "effective." By effective, she means:

"1) people using the streets at different times must actually use the same streets. If their paths are separated from one another's, or buffered from on anther's there is no mixture in reality[...]

2) people using the same streets at differing times must include, among them, people who will use some of the same facilities[...]

3) the mixture of people on a street at one time of day must bear some reasonably proportionate relationship to people there at other times of day. It has often been observed that lively downtowns are apt to have dwellings fingering into them and close beside them, and night uses these residents enjoy and help support."[65]

Not only for the purposes of generating diversity and vitality, but for efficient use of park, shops, parking and traffic facilities, the time spread of users is important.[66]

5) Providing Social and Economic Supports to Families

MXDs can provide support to families in two ways: more economic opportunities for parents, and more places for children to play and learn. Davis mentions in his book *Living Over the Store* that by putting dwelling and work into the same unit, the ultimate type of MXDS, a family can run a small business with minimum resources since they don't need extra rental payment for the shops or offices.[67] I believe, not only this type, but also other types of MXDs can provide families more economic choices. By the

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64 Jane Jacobs, *The Death and Life of Great American Cities*,(New York: Random House, 1961), 152
65 Jane Jacobs, *The Death and Life of Great American Cities*,(New York: Random House, 1961), 163-164
66 Ibid, 170
67 Howard Davis, *Living Over the Store: Architecture and Local Urban Life*, (New York: Routledge, 2012),7

close proximity of working and living places, parents have more opportunities to take care of their career and children at the same time. Feminists also argue that the greater integration of land uses will promote greater equality of opportunities for females.[68]

The other advantage of MXDs for families is that the sidewalks in cities are good playgrounds for children to explore and learn under other grownups' supervision. As Jacobs states *"The people of cities who have other jobs and duties[...] can, and on lively diversified sidewalks they do, supervise the incidental play of children and assimilate the children into city society. They do it in the course of carrying on their other pursuits.[...] In real life, only from the ordinary adults of the city sidewalk do children learn[...] the first fundamental of successful city life: People must take a modicum of public responsibility for each other even if they have no ties to each other."* [69] She further suggests that thirty or thirty-five feet wide sidewalks, with trees to shade the activities and sufficient space for pedestrian circulation, can serve any demand of incidental play put upon them.[70]

6) Making Streets Safer

According to Jacobs, the other critical function of MXDs is that these fine-grain mixed uses can secure the public realm. From Jacobs's point of view, cities are different from towns and suburbs because cities are full of strangers.[71] In cities, it is not easy to recognize who is a stranger that we should watch, so how to keep the public peace became an important issue. Jacob thinks the public peace is not kept primarily by the

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[68] Alan Rowley, "Mixed-use Development: am bigous concept, simplistic analysis and wishful thinking?" Planning Practice and Research, Vol.11, No.1, P.85-97, 1996, P.90

[69] Jane Jacobs, *The Death and Life of Great American Cities*,(New York: Random House, 1961), 82

[70] Ibid, 87

[71] Ibid, 30

police but by *"an intricate, almost unconscious, network of voluntary controls and standards among the people themselves."*[72]

There are three main qualities to make this self surveillance happen: 1) there must be a clear demarcation between what is public space and what is private space; 2) there must be eyes upon the street; 3) the sidewalk must have users on it fairly continuously.[73]

In order to put enough eyes and users on the streets, substantial quantities of stores and other public places sprinkled along the sidewalks are necessary. 1) First, they give people (both residents and strangers) concrete reasons for using the streets; 2) they draw people along the sidewalks past places which have no attractions in themselves but which become traveled and peopled as routes to somewhere else; 3) storekeepers and other small businessmen are typically strong proponents of peace and order themselves; 4) the activity generated by people on errands, or people aiming for food or drink, is itself an attraction to still other people; 5) the sight of people attracts still other people because people love watch activity and other people on the streets.[74]

As a result, we can imagine in a city environment, mixed uses are vital for the safety of residents and other users.

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[72] Ibid, 31-32
[73] Jane Jacobs, *The Death and Life of Great American Cities*,(New York: Random House, 1961), 35
[74] Ibid, 36-37

2.2.2. The Issues of Mixed-Use Developments

Copland organizes the disadvantage of MXDs into the categories of definite disadvantages and possible disadvantages. The definite disadvantages of MXDs are: 1) property assets are harder to dispose of quickly; 2) they require active management of property; and 3) therefore, it is harder to get a loan and may put some possible tenants off. The possible disadvantages are: 1) lower rents achieved for the developers; 2) it introduces the problem of separate access needed for each use; 3) there is conflict between activities; noise, traffic and etc.[75] Copland discusses the drawbacks of MXDs from a broader point of view, emphasizing market and property management issues. In contrast with Copland, this PR focuses on the urban design aspect. Disadvantages from an urban design perspective include: 1) increased construction costs, 2) high levels of ground floor commercial vacancy, 3) more public open space needed, 4) parking and traffic issues, 5) negative externalities from commercial uses, 6) users' circulation- the issue of private and public.

1) Increasing Construction Costs

The most mentioned issue of MXDs is the higher than normal construction costs. Since MXDs need extra planning, design, management and capital resources, the risks associated with constructing MXDs are larger than single-use projects.[76] The increased cost is mainly caused by the conflicts of different spatial scales and needs of different uses in the same project. For instance, a grocery store may need underground parking because of the additional requirements for residential units in the same mixed-use project. Another example is that the construction cost of residential units may be raised by the need to design and construct compatible sized units for preservation of the store's

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75 Andy Coupland, *Reclaiming the city : mixed use development* (London: Chapman & Hall, 1998), 4

76 Dean Schwanke, Mixed use development handbook (Washington D.C.: Urban Land Institute, 2008), 28

standard dimensions.[77] In other words, the legal requirements and the inherent spatial needs of different uses may cause inconsistent or overlapping design needs and add extra expenditures to MXDs.

2) High Levels of Ground Floor Commercial Vacancy

Some MXDs were built because of the government incentives instead of the free market mechanism. This may indirectly cause high levels of ground floor commercial vacancy. From my observation in Austin, a high ratio of ground floor stores in MXDs are still waiting to be leased. I think the reason behind these low occupancy of ground floor stores is because, in Austin, mixed use projects that meet the requirement of the "Subchapter E. Design Standards and Mixed Use" can have development bonuses. Some of these development bonuses include no maximum floor area ratio, no maximum building coverage and so on.[78] These codes encourage constructors to build mixed use buildings but they can't control and predict private market demand.

The same situation happened in England. "Delivering street level occupancy has generally proved problematic" Joord mentions in his article.[79] Joord uses the data of Giddings, E. and Craine, T. (2006) which states that MXDs in London completed between 2001 to 2005 had vacancy rates of 27 percent for retail space and 34 percent for office space.[80] In contrast with my point of view, Joord thinks bad architecture and

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[77] Sheldon A. Halpern and Steven P. Heller, "MIXED-USE PROJECTS: DOCUMENT AND DEVELOPMENT", (Pircher, Nichols & Meeks, the Real Estate Law Firm: 2004) http://www.pircher.com/resources/article.php?i=310 (Retrived: 2012 December,29)

[78] City of Austin, "Subchapter E: Design Standards and Mixed Use sub-chapter of the Land Development Code," (Austin TX: City of Austin, 2009)

[79] Jo Foord, "Mixed-Use Trade-Offs: How to Live and Work in a 'Compact City' Neighborhood," London: Built Environment Vol.36 No.1, 2010, P.49

[80] Jo Foord, "Mixed-Use Trade-Offs: How to Live and Work in a 'Compact City' Neighborhood," Built Environment Vol.36 No.1, 2010, P.49; Originally, Giddings, E. and Craine, T. (2006) Mixed-use Performance in Residential-Led Developments in London. London: London Development Research.

urban design may be the cause of the high vacancy rate of ground floor commercial spaces.[81]

3) More Public Open Space Needed

As opposed to single-family houses, residential units of MXDs are usually apartments which don't have private courtyards. In live-work units where people live and work in the same units, they are often isolated during their workdays. For the people live in these kinds of MXDs, public open spaces are important for them in order to have some physical activities and casual interactions which can build the sense of community at the same time.[82] Therefore, well-designed open spaces, regardless of whether they are provided by the projects, which are located in the neighborhoods or are the sidewalks themselves, are significant for the residents in MXDs

4) Parking and Traffic Issues

By definition, MXDs include three or more significant revenue-producing uses in the same projects. Different uses will product and attract different traffic flows with different peak hours; therefore their parking requirements are different. Parking designs for single-use projects are not sufficient for MXDs; the parking rules and regulations of MXDs should address *"the varying timing, volume, security and access needs of diverse users."*[83] For example, office users usually pay for parking rights but the customers of retail users normally park for free. Preventing office users from parking on the free retail parking areas, or preventing retail customers from mistakenly parking on the office

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[81] Jo Foord, "Mixed-Use Trade-Offs: How to Live and Work in a 'Compact City' Neighborhood," London: Built Environment Vol.36 No.1, 2010, P.49

[82] Thomas Dolan, Live-Work Planning and Design: Zero-Commute Housing,(New Jersey: Wiley, 2012), 109

[83] Sheldon A. Halpern and Steven P. Heller, "MIXED-USE PROJECTS: DOCUMENT AND DEVELOPMENT", (Pircher, Nichols & Meeks, the Real Estate Law Firm: 2004)

or residential parking areas can be a challenge.[84] MXDs also make the calculation of how much parking is required more complicated because of the different ratios applying to each uses. Halpern and Heller suggest that the developers of MXDs can switch ratios among users while maintaining required ratios that apply to specific parcels or to the overall project.[85]

5) Negative Externalities from Commercial Uses- Noise, Smoke and Light

In MXDs, the needs of diverse users regarding noise, smoke and light are different. These are the basic issues that MXDs have to take into consideration.[86] For example soundproofing and ventilation systems are necessary for residents living above entertainment, restaurant or retail uses. Moreover, residents also have different lighting needs with other commercial users. Lights may shine upon other parts and adversely affect other users in the same project.[87] Halpern and Heller recommend MXDs may require establishment of uniform lighting hours with a process for requesting additional hours.[88] From my point of view, this lighting issue may be alleviated by careful design as well.

Additionally, there are more subtle design and use issues related to MXDs. Will different types of users share elevators? If so, how can their different needs for privacy, efficiency, safety and so on, be met in the same place? Where are the trash collection areas for each use, what are the hours they collect the trash, and how can we lighten the

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84 Sheldon A. Halpern and Steven P. Heller, "MIXED-USE PROJECTS: DOCUMENT AND DEVELOPMENT", (Pircher, Nichols & Meeks, the Real Estate Law Firm: 2004)
85 Ibid
86 Sheldon A. Halpern and Steven P. Heller, "MIXED-USE PROJECTS: DOCUMENT AND DEVELOPMENT", (Pircher, Nichols & Meeks, the Real Estate Law Firm: 2004); Jo Foord, "Mixed-Use Trade-Offs: How to Live and Work in a 'Compact City' Neighborhood," London: Built Environment Vol.36 No.1, 2010, P.49
87 Sheldon A. Halpern and Steven P. Heller, "MIXED-USE PROJECTS: DOCUMENT AND DEVELOPMENT", (Pircher, Nichols & Meeks, the Real Estate Law Firm: 2004)
88 Ibid

influence, noise and odor from trash collection for other users? Where are the retail loading areas and how do they fit into residential or office environment without disturbance?[89]

Addressing the issues above are critical for developing a good mixed-use project for every uses in the project. They should also be considered for accommodation of residential areas outside the project.[90]

6) Users' Circulation- the Issue of Private and Public Spaces

Unlike single-use projects, mixed-use projects usually need more than one major access for their different users since different uses require differing levels of privacy and security. Retail areas need to be broadly accessible to the public, while office, hotel and residential areas require escalating degrees of privacy and security.[91] These requirements for different types of access for different uses should be extended to parking areas and building entrances: it should not be necessary to pass through public or commercial spaces to reach residential uses, nor should you have to pass through private environments to reach public or commercial areas.[92] From my point of view, how to extend these entrance qualities for each use to the area outside the projects is also important. In addition, the management of the balance between private and public, conflict and security is interesting, especially in the environment of MXDs. As Jacobs states, *"A good city street neighborhood achieves a marvel of balance between its*

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89 Sheldon A. Halpern and Steven P. Heller, "MIXED-USE PROJECTS: DOCUMENT AND DEVELOPMENT", (Pircher, Nichols & Meeks, the Real Estate Law Firm: 2004)
90 Ibid
91 Rodney E. Engelen, "Problems Achieving Mixed Use," http://www.mixedusecores.com/documents/Problems%20Achieving%20Mixed%20Use.pdf (2007)(Retrieved: 2013 January, 2)
92 Ibid

people's determination to have essential privacy and their simultaneous wishes for differing degrees of contact, enjoyment or help from the people around."[93]

2.2.3. Conclusion

The advantages and issues of MXDs have been discussed above. Followings are two tables summarizing the six advantages and issues of MXDs and their related topics regarding the three elements in the sustainable triangle: -social, -environmental and -economic. If one of the advantages of MXDs is reinforced, its corresponding sustainable elements will be enhanced; if one of the issues is not improved, its corresponding elements will decline. The next chapter is going to briefly introduce some regulatory tools for MXDs.

[93] Jane Jacobs, *The Death and Life of Great American Cities*,(New York: Random House, 1961), 59

Advantages of MXDs	Related Topics
1) reducing travel time to work	
2) public transportation and pedestrian oriented	
3) improving economic opportunities and keeping the community vibrant	
4) enhancing urban vitality	
5) providing social and economic supports to families	
6) making streets safer.	

Table 3: Advantages of MXDs and their Corresponding Sustainable Elements

Issues of MXDs	Related Topics
1) increased construction costs	
2) high levels of ground floor commercial vacancy	
3) more public open space needed	
4) parking and traffic issues	
5) negative externalities from commercial uses	
6) users' circulation- the issue of private and public	

Table 4: Issues of MXDs and the Corresponding Sustainable Elements

2.3. REGULATION ISSUES OF MIXED-USE DEVELOPMENTS

Like any other city buildings, the developments of mixed-use projects are driven by three main sets of interests: *1) profit-seeking private developers and investors*, *2) public authorities* and *3) voluntary organizations, groups and individuals.*[94] They are limited by three powers: *1) the resources for development from both the private and public sectors, as well as the economy, 2) the politico-juridical rules which limit the construction of development opportunities,* and *3) the cultural ideas and values that people hold about what should be built.*[95] This PR will discuss the role of public sector in MXDs; in particular, how regulations and rules influence MXDs, and how we can improve those regulations and rules to solve the problems of MXDs and enhance the merits of them?

There are many ways municipalities can execute to encourage MXDs, including: 1) apply mixed-use zoning or other flexible land use regulations in their local codes; 2) provide design guidelines to promote effective design standards for MXDs; 3) streamline the approval process for desirable MXDs, which helps to reduce the developer's risk; 4) use public meeting and charrettes to envision new MXDs.[96] The case studies of this PR will focus on the influences from regulations and design guidelines on MXDs.

Zoning, the most traditional land use regulatory tool, has been recognized as controlling land uses by negative approaches: defining what can be done but seldom promoting what should be done. In recent decades, critics seek to improve the

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[94] Rowley, Alan, "Mixed-use Development: ambiguous concept, simplistic analysis and wishful thinking?" Planning Practice and Research, Vol.11, No.1, P.85-97, 1996; Originally, Ambrose, P. (1994) Urban Process and Power (London, Routledge).

[95] Rowley, Alan, "Mixed-use Development: ambiguous concept, simplistic analysis and wishful thinking?" Planning Practice and Research, Vol.11, No.1, P.85-97, 1996; Originally, Healey, P. & Barrett, S. (1990) Structure and agency in land and property development processes: some ideas for research, Urban Studies, Vol. 27, No. 1 pp. 89-104.

[96] Dean Schwanke, Mixed use development handbook (Washington D.C.: Urban Land Institute, 2008), 137

traditional zoning tool in two ways: by respecting a more beneficial, well-planned integration of different land uses at a proper scale; and by paying attention to incentives for better design, amenities, affordable housing, and other public purposes. Many regulatory tools have been developed for fulfill these purposes.[97] The following paragraphs discuss how to implement those tools for MXDs. These tools include 1) mixed-use zoning district, 2) overlay district, 3) planned unit development, 4) specific plan, and 5) performance standard.[98] Other than these five innovative zoning tools, form based codes, which are rules that don't "zone" lands but instead provide detailed and illustrated design codes of them, have been mentioned with MXDs recently[99] will be discussed in the following as 6) form-based code.

2.3.1

1) Mixed-Use Zoning District

Uses in the same zone of districts that allow different types of uses should be reasonably related and compatible. A mixed use zoning district encourages more flexible zoning which can create of vibrant, pedestrian-oriented community and neighborhood centers. It also specifies the location of MXDs, so that neighborhood opposition can be addressed in advance.

2) Overlay District

An overlay district is a mapped area with special regulations which promote and manage MXDs. As its literal meaning, an overlay district is superimposed over

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[97] Dean Schwanke, Mixed use development handbook (Washington D.C.: Urban Land Institute, 2008), 142-143

[98] Dean Schwanke, Mixed use development handbook (Washington D.C.: Urban Land Institute, 2008), P. 143, Originally, Georgia Department of Community Affairs, Encouraging Mixed-Use Development

[99] Emily Talen, Design for Diversity- Exploring Socially Mixed Neighborhoods, (Oxford, UK: Architectural Press, 2008), 117-122; Nan Ellin, *Integral Urbanism*, (New York: Routledge, 2006), 36-41

traditional zoning districts, but it may also be used as a standalone regulation to manage MXDs in desired areas of the community. The benefits of mixed-use overlay district are similar to those of a mixed-use zoning district. It can also provide more flexible mixed-use rules over the basic zoning. Overlay districts, however, may add complexity to local development regulations.

3) Planned Unit Development

Planned unit developments (PUDs) allow developers to propose planned MXDs for sites they choose in the community. The plans will be approved only if they meet specified community standards. PUDs may help to avoid heavy rezoning processes, which alleviates the time and cost burden for developers. It also enables developers to create vibrant, pedestrian-oriented community and neighborhood centers.

4) Specific Plan

A Specific Plan is a detailed plan that indicates how a particular area of the community should be developed regarding the location, size, and use of buildings. It can be used to promote MXDs by locating different uses close together in the plan. It gives developers the maximum flexibility to design creative, vibrant MXDs. But, it can be rather complex to administer, as plans are negotiated project by project.

5) Performance Standard

Regulation of development is based on predetermined standards which are related to the development's impact on neighboring properties. One example is the environment, or local public service capacity. The separation of uses is not required; i.e., a particular use can locate anywhere as long as it meets the performance standards. It is an effective method to manage impacts of development without requiring separation of uses. Yet, opposition may arise as a result of the uncertainty about particular uses that may locate

nearby. Its complexity may be difficult for the general public and developers to understand.

6) Form-Based Code

Form-based codes use physical form, rather than separation of uses as in traditional zoning, as the organizing principle for the land development regulations. The codes not only address form-based rules within private building lines but also define the relationship between building facades and the public realm, the form and mass of buildings in relation to one another, and the scale and types of streets and blocks. Form-based codes usually contain the following parts: a regulating plan, public space standards, building form standards, administration and definitions.[100] Form-based coding is based on the assumption that what happens within a building is less important than the form of the building and its relationship to other buildings or to the public realm. Therefore, it doesn't segregate land uses, but instead promotes mixed uses of land.[101]

2.3.2 Conclusion

Several MXDs regulatory tools have been introduced above. The major purpose of them is to provide sufficient flexibility in encouraging private sectors to develop MXDs, while still restricting incompatible uses or building forms. In the following subchapter, I am going to talk about the land use and mixed-use regulatory backgrounds of the case study sites in this PR, including Portland, Seattle and Vancouver.

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[100] Form-Based Codes Institute, " What Are Form-Based Codes?" http://formbasedcodes.org/what-are-form-based-codes (2011) (Retrieved: April, 2, 2013)

[101] Nan Ellin, *Integral Urbanism*, (New York: Routledge, 2006), 38

2.4. MXDs Regulatory Backgrounds of Case Studies Cities

In this subchapter, the general land use regulatory backgrounds of the three case-study cities: Portland, Seattle and Vancouver, will be introduced. Following by that, I will use the case-study sites as examples to discuss the MXDs related regulations for each city from a land use and design perspective. The three case-study sites are: North Pearl District, Portland; South Lake Union, Seattle; and False Creek North, Vancouver.

2.4.1. Portland, Oregon

General Regulatory Backgrounds

The major mandatory tools for land use and development in the City of Portland are the municipal codes- Title 33 Planning and Zoning (Title 33). There are three kinds of zoning districts in these codes: Base Zone, Overlay Zone and Plan District. **Base Zone** covers the whole city area; every lot has its zoning code. Open Space Zone, Single-Dwelling Residential Zones, Multi-Family Residential Zones, Commercial Zones and Employment and Industrial Zones are the five main Base Zones. Some of the areas in the city may be also designated as **Overlay Zones,** which address specific subjects for the particular area; for example, there are Design Overlay Zone, Historic Land Mark Overlay Zone, River Industrial Overlay Zone and so on. In addition to Base Zones and Overlay Zones, there are **Plan Districts**. If Overlay Zones are more subject specific, Plan Districts are more location specific. Examples of these include the Central City Plan District, East Corridor Plan District and Swan Island Plan District. There are twenty-nine Plan Districts and fourteen Overlay Zones in the Title 33. When the regulations conflict, the Plan District regulations supersede the Overlay Zone and the Base Zone's regulations; the Overlay Zone regulations supersede Base Zone's codes.[102]

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[102] City of Portland, *Municipal Code*, "Title 33 Planning and Zoning " (Portland: 2010)

Beside codes for the three kinds of zones, Parking and Loading Codes can be found in the same Title 33 Codes as well. They set rules regarding the minimum and maximum of parking spaces, and other related issues for each of the different uses.[103]

Other than these mandatory codes, Portland has a citywide comprehensive plan as well as many other plans and guidelines for shaping the land use development in the city. Most of them are interpretative, but some of them may be mandatory by coding into the Title 33 codes.

The following are MXDs related codes, plans and guidelines of the North Pearl District, Portland.

Land Use Perspective

The North Pearl District (defined by the North Pearl District Plan) is designated to Open Space (OS) and Central Employment (EX) zones in the Base Zone Codes. The land uses are very restrictive in the OS zones but flexible in the EX zones which allow most of the residential, commercial and industrial uses.[104]

The North Pearl District is included in the Central City Plan District, which is ruled by the Title 33, Chapter of Central City Plan District. Based on the concern of local characters, it provides more restrictive or flexible land use regulations than the Base Zone Codes. For instance, vehicle repair uses are allowed in the EX zones of the Base Zone Codes but are prohibited in the Central City Plan District Codes for the Central City area; on the contrary, the Central City Plan District Codes permit additional uses, such as food stands, in OS Zones for respecting the urban spirit in the area.[105]

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[103] City of Portland, *Municipal Code*, "Title 33 Planning and Zoning " (Portland: 2010)
[104] Ibid
[105] Ibid

For managing the conflicts between different uses in MXDs, there are two autonomous kinds of rules in the Central City Plan District Codes. Instead of fixed mandatory rules for noise, odor and light, and transportation issues, the Codes require two kinds of autonomous document from the developers of major event entertainment or commercial outdoor recreation uses: the Good Neighborhood Agreement and Comprehensive Transportation Management Plan. In these two documents, developers may measure their impacts to the surrounding neighborhood and provide some solution to mitigate the impacts. Both of the two documents are required by some kinds of stakeholder meetings and City Council hearings that are designed to inform the neighborhood and take their opinions.[106]

Design Perspective

The regulations of EX zone in the Base Zone Codes address floor area ratio (FAR), height, building setback rules and other basic design requirements. The Base Zone Codes also addresses more detailed design requirements or opportunities, such as FAR transfer, ground floor window design, pedestrian circulation and transit street main entrance design.[107]

Compared to the Base Zone Codes, the Central City Plan District Codes provide localized and flexible design rules. For example, they provide a FAR bonus, height bonus, and more FAR transfer opportunities for the North Pearl District. The same holds true for the requirements of open areas and the window designs above the ground floor.[108] All of them are trying to shape the special mixed-use qualities of the North Pearl District.

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106 City of Portland, *Municipal Code*, "Title 33 Planning and Zoning " (Portland: 2010)
107 Ibid
108 Ibid

Besides Base Zone and Special District Plan, the North Pearl District is also regulated by the codes for Design Overlay. A Design Review is required for all new development, exterior alteration and other design related alteration/construction in the area located within the Overlay; unless the applicant choose to meet the objective standards of the Community Design Standards in the Title 33 Codes.[109] The reference materials of the Design Review for the North Pearl District are Central City Fundamental Guidelines and River District Design Guidelines. Different from the Base Zone Codes and Plan District Codes which provide restrictive rules with non-negotiable numbers and requirements, those Design Guidelines address more strategy types of rules.[110]

For parking designs, developers should look at the codes in the Chapter of parking and Loading in Title 33 as well. The codes in the chapter require the minimum parking lots for every uses with the exceptions of joint use parking and the sites well served by transit.

2.4.2. Seattle, Washington

General Regulatory Backgrounds

Besides the citywide City of Seattle Comprehensive Plan and Seattle Design Guidelines, there are three major documents which rule or guide the land use and development in Seattle: 1) Seattle Municipal Codes, 2) Neighborhood Plans and 3) Neighborhood Design Guidelines.

The Seattle Municipal Codes- Title 23 Land Use Codes (Title 23) are the tools for controlling the built environment in Seattle. They include mandatory codes, such as the land uses, building height, setbacks and other standards, and incentive codes, such as the

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109 City of Portland, *Municipal Code*, "Title 33 Planning and Zoning " (Portland: 2010)

110 City of Portland, *River District Design Guidelines,* Adopted by Portland City Council: 1996, Ordinance No. 182319 (Portland, 2008)

Affordable Housing Incentive Program. Furthermore, Title 23 contains two zoning types: basic zoning and overlay districts. The **basic zoning** mainly includes: Single Family (SF), Multifamily Lowrise (RSL), Multifamily Midrise (MR), Mutifamily Highrise (HR), Residential-Commercial (RC), Neighborhood Commercial (NC), Seattle Mixed (SM), Commercial (C), Downtown Mixed Commercial (DMC), Downtown Mixed Residential (DMR), Industrial (I) and many other zoning districts. **Overlay districts** are used to preserve exceptional spaces, ex. natural marine and mountain settings. There are ten overlay districts in the Codes; These include the Shoreline District, Airport Height Overlay District and Sand Point Overlay District. Those overlay district codes are mandatory rules.[111]

The **Neighborhood Plans** are subchapters in the Seattle's Comprehensive Plan. There are total thirty-three Neighborhood Plans in Seattle. They provide goals, policies and strategies of many topics, such as transportation, housing and open space issues, for guiding the development of the neighborhoods. Those goals, policies and strategies are Interpretative, only implemented by adopting regulations which can then become mandatory.[112]

There are a total of eighteen **Neighborhood Design Guidelines** in Seattle. The purposes of them are to define the qualities of architecture, urban design, and public space of communities, and to serve as an interpretative tool for guiding individual projects to meet those expectations through the City's Design Review Program.[113]

The followings are MXD related codes, plans and guidelines of the case study site- South Lake Union, Seattle.

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111 City of Seattle, *Municipal Code,* "Title 23 Land Use Code," (Seattle)
112 City of Seattle, *City of Seattle Comprehensive Plan,* (Seattle, 2005)
113 City of Seattle, *Seattle Design Guidelines,*(Seattle, 2012)

Land Use Perspective

The case study area- South Lake Union is defined in the South Lake Union Neighborhood Plan. Within the area, there are three major zoning districts: Seattle Mixed, Industrial Commercial, and Commercial 2; there is no overlay district. Their land use related regulations are in Title 23. There are lists of prohibited uses and conditional uses for each zone. Generally, all uses are permitted outright except the prohibited and conditional uses. For instance, Seattle Mixed zone has more restricted land-use categories than the other two zones. In the Seattle Mixed zone the following uses are prohibited: all high-impact uses, all heavy manufacturing uses, principal use surface parking, animal shelters and kennels and so on. Otherwise, all other uses are permitted.[114]

In the Seattle Mixed zone and Commercial 2 zone, the street level uses are ruled by a separate set of regulations. In the Seattle Mixed zone, seventy-five percent of street level uses should be one of these five kinds: general sales and service uses, eating and drinking establishments, entertainment uses, public libraries and public parks.[115]

Affordable housing is promoted in the codes as well: with qualified low-income housing, developers may obtain extra building height.[116]

Additionally, noise, odor and light are controlled in these codes. For example, the codes define lists of major noise generator and major odor sources; the uses on the lists shall meet more restricted noise or odor regulations.[117]

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114 City of Seattle, *Municipal Code*, "Title 23 Land Use Code," (Seattle)
115 Ibid
116 Ibid
117 Ibid

Design Perspective

The Municipal Code- Title 23 Land Use Code states the mandatory heights, upper-level and street-level setbacks, parking access, street level design and other design related rules. Even within the same zoning district, the maximum height may be different because of different locations and related bonus heights codes.[118]

Besides the Codes, MXD-associated design issues are guided by South Lake Union Neighborhood Plan and South Lake Design Guideline. Compared to the Design Guidelines, the Neighborhood Plan is more comprehensive and strategy oriented, and the scale is broader. For example, open space is one of the essential elements for MXDs; although this is mentioned in both the Neighborhood Plan and the Design Guidelines, their contents are very different. In the Neighborhood Plan, community scale public open spaces are discussed; in contrast, in the Design Guidelines, the design of building or project scale open space (either private or public) are discussed.[119]

2.4.3. Vancouver, British Columbia, Canada

General Regulatory Backgrounds

Besides the citywide Vancouver Comprehensive Plan, there are three major documents rule or guide the land use and development in Vancouver: 1) Zoning and Development By-laws, 2) Official Development Plan By-laws, and 3) Policies and Guidelines.[120]

Each of area in the City of Vancouver is designated to a Zoning District in the **Zoning and Development By-laws**. In the By-laws, land uses, floor areas, densities, heights, parking and other land use or design related issues are regulated. In addition,

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118 City of Seattle, *Municipal Code,* "Title 23 Land Use Code," (Seattle)

119 City of Seattle, *South Lake Union Neighborhood Plan,* (Seattle, 2006); City of Seattle, *South Lake Union Design Guideline,* (Seattle, 2005)

120 City of Vancouver, *Zoning and Development By-law,* (Vancouver)

the Zoning and Development By-laws state the related policies and guidelines clearly. There are eight main districts in the By-laws, including Limited Agriculture (RA), One-Family Dwelling (RS), Two-Family Dwelling (RT), Multiple Dwelling (RM), Commercial (C), Industrial (M&I), Historic Area (HA) and Comprehensive Development (CD). Among them, the CD districts are meticulously regulated: there are 538 sub-districts in the CD category, and each of them has its independent Zoning and Development By-laws, almost regulated project by project. Other zoning districts have about one to ten sub-districts.[121]

Different from the zoning rules in the Zoning and Development By-laws, which generally apply across the whole City of Vancouver, the **Official Development Plan By-laws** (ODP) focuses on particular areas or large redevelopment projects. The ODPs are sophisticated sets of planning controls, including both mandatory and interpretative clauses.[122] For instance, the Downtown ODP is a by-law to regulate the development in the Downtown District defined by the Land Use and Development By-laws; but the False Creek North ODP is an overall guide for the development in the False Creek North area, as well as a guide for the preparation of future False Creek North zoning bylaws.[123] The former is more mandatory than the latter, but generally the ODPs all have some power to control the development and development related instruments.

There are many **policies and guidelines** documents for directing the development of the built environment in the City of Vancouver. They can be organized into the following categories: zone specific (ex. RT-2 Multiple Dwelling Guidelines), location specific (ex. Downtown Eastside Housing Plans), or topic specific (ex. Public Art

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121 City of Vancouver, *Zoning and Development By-law,* (Vancouver)

122 John Punter, *The Vancouver Achievement- Urban Planning and Design* (Vancouver: UBC Press, 2003), 187-218

123 City of Vancouver, *Downtown Official Development Plan,* (Vancouver,2006); City of Vancouver, *False Creek North Official Development Plan,* (Vancouver, 2008)

Policies and Guidelines). Those guidelines which primarily guide development and assist the development permit application are interpretative.[124]

I am going to introduce the MXDs associated by-laws and guidelines of the case study site- False Creek North, Vancouver, in the following parts.

Land Use Perspective

The land use and MXD-related bylaws are located in the **Zoning and Development By-laws(ZDB)** and in the **False Creek North Official Development Plan By-laws (FCNODP)**. Within the False Creek North area (defined by the FCNODP), there are eleven Comprehensive District Zoning By-Laws (CD-1 ZDBs) and one B.C Place/Expo District ZDB. Regarding land uses, they regulate the *location* and *density* (maximum total floor area) for each of the permitted uses. Residential, office, hotel, retail and service are the major land uses permitted in the area. Different from the separated-document structure in the ZDB, the FCNODP is a integrated single document for the whole area. It combines the regulations in separated ZDBs, treating the False Creek North area as a single area. FCNODP provides land use regulations for the whole area by illustrations and tables that show the location, density of major land uses in the area comprehensively.

There are two land use related issues stated in the **policies and guidelines**. In the False Creek North policies and guidelines, they delineate event-related land use issues, such as the event noise control for residential buildings. The other land use and MXDs related guideline is the "Live/Work and Work/Live: Vancouver Overview, including Strategic Directions" which points out as long as there are no employees or

[124] City of Vancouver, *Land Use and Development Policies and Guidelines,*(Vancouver)

product sales from or within the dwelling, homecrafts and art studios are permitted in any dwellings.

Design Perspective

As the structure in the land use aspect, for design related issues, in the False Creek North area, developers should follow the eleven CD-1 ZDBs and one B.C Place/Expo District ZDB. They determine matters of building height, acoustic, parking, loading, and other issues for each area separately. These rules are also stated in the FCNODP comprehensively for the whole False Creek North area.

Some of those CD-1 ZDBs have corresponding guidelines. In these guidelines, architectural characteristics, issues of residential livability, assesses for users with different purposes and so on are described in more detail. Besides, there are other MXDs related design guidelines for various topics, such as Live-Work Use Guidelines, Interior Public Space Guidelines, High-Density Housing for Families with Children Guidelines, Guidelines for New Development Adjacent to hotels and Rooming Houses and Plaza Design Guidelines. For the most part, these design guidelines are relevant to light and ventilation, safety and security.

2.4.5. Conclusion

The basic land use regulatory systems of the three cities of the case-study sites were introduced in the earlier paragraphs. Table 5 is a summary chart of the land use regulatory systems of the three case-study cities. The backgrounds (brief history, geography, social, economic and environmental characters) of the three sites, and the more detailed mixed-use regulations and guidelines will be discussed in the Chapter IV Case Studies following Chapter III Methodology. In this report I intend to delineate the best regulatory mechanisms of these three case studies.

Documents	Potency			Coverage	
	Manda -tory	Incen -tive	Interpr e -tative	Some Areas	All Areas
City of Portland					
Planning and Zoning Code- Base Zone	●	●			
Planning and Zoning Code-Overlay Zone	●				
Planning and Zoning Code-Plan District	●	●			
Other Plans and Guidelines			●		
City of Seattle					
Land Use Code- Zoning	●	●			
Land Use Code- Overlay Districts	●				
Neighborhood Plans			●		
Neighborhood Design Guidelines			●		
City of Vancouver					
Zoning and Development By-laws	●				
Official Development Plan By-laws	●		●		
Policies and Guidelines			●		

Table 5: Land Use Regulatory Systems of the Case-study Cities

Chapter III: Methodology

In Chapter IV: Case Study, the relationship between MXD-related codes and the corresponding realities of each site will be introduced and discussed. The three case study sites, North Pearl District, Portland, South Lake Union, Seattle and False Creek North, Vancouver, were selected because they are considered best practices of MXDs and the three cities are also deemed as innovative in the city planning field.

The subtopics of the case studies were generated from the six advantages of MXDs and the six issues of MXDs discussed in Chapter II (Table 6). I integrated those advantages and issues into the discussion of MXDs related rules. The seven subtopics of MXDs rules analysis are: 1. General Zoning and Design Rules; 2. Ground Level Land Use and Design Rules; 3. Open Space Rules; 4. Live-work Rules; 5. Nuisance Rules; 6. Parking Rules; 7. Affordable Housing Rules.

Some of the rules are easy to link to existing situations; for example, land use, design and open space rules. While with the help of Google Street View, I can observe and analyze the influence of those rules, it is hard to know the effects of other rules. For example, I couldn't find the location and quantity information of existing live-work units. From my point of view, although it is hard to know the actual consequences of those rules, it is still worth it to know and compare the regulations of the three sites. Given that the mixed-use regulations of the three sites were all adopted in the 1990s, I think it is good timing to analyze their effects after twenty years. The basic structure of the methodology for the case studies is in Figure 4.

Advantages of MXDs
1) reducing travel time to work
2) public transportation and pedestrian oriented
3) improving economic opportunities and keeping the community vibrant
4) enhancing urban vitality
5) providing social and economic supports to families
6) making street safer.
Issues of MXDs
1) increased construction costs
2) high levels of ground floor commercial vacancy
3) more public open space needed
4) parking and traffic issues
5) negative externalities from commercial uses
6) users' circulation- the issue of private and public

Table 6: Advantages and Issues of MXDs

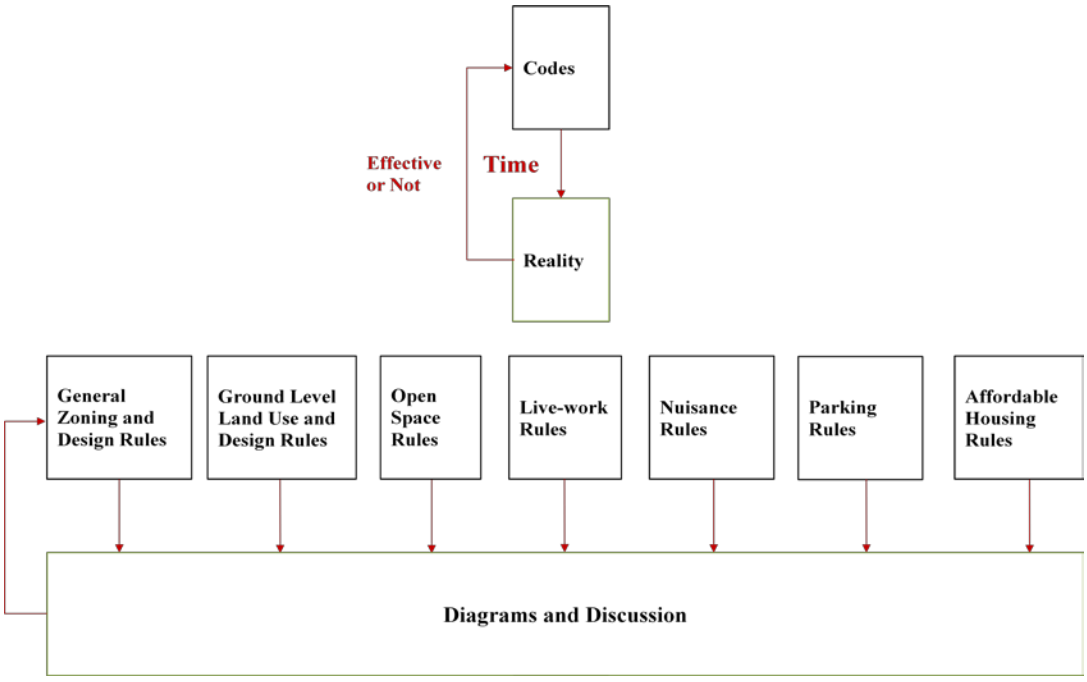

Figure 4: The Flowchart of Methodology

In the next chapter I will illustrate the rules and the effects of the three sites. The following explains the approaches of making those diagrams.

3.1. Diagrams of Land Use Rules

These diagrams are intended to show how the cities regulate mixed land uses. This set of maps is translated from their official zoning maps. In order to make them clearer and more comparable, I simplified their permitted land use categories into residential, office, retail and service, and industrial use. Figure 5 shows the basic patterns used in the land use diagrams.

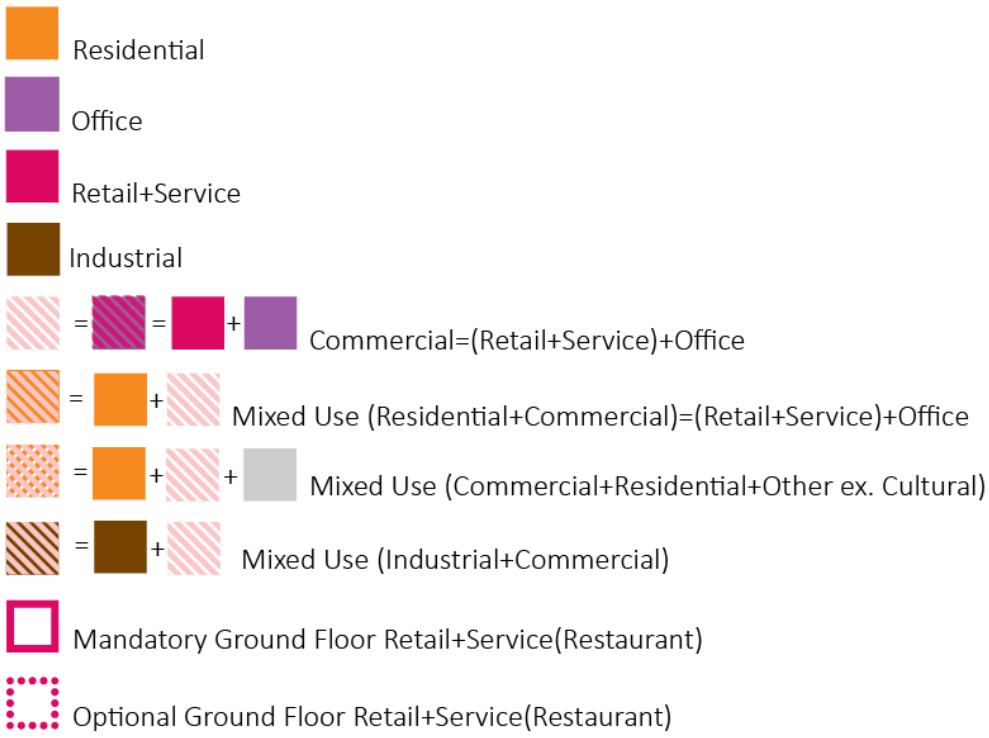

Figure 5: Patterns of the Diagrams for Land Use Rules

3.2. Diagrams of Current Land Uses

Some cities may have their existing land use data online as Geographic Information System (GIS) files. However, there is no GIS data for the three case study cities in this report, so I will rely on Google street view to acquire the land use data of the three sites. For some ambiguous looking structures, I will search them on *emporis.com* to find their uses. Emporis.com provides basic building data, and I found that data coverage for new structures is very high. These diagrams will diagrammatically show some patterns of land use rules.

3.3. Diagrams of Maximum Heights

Although I intended to diagram the whole set of density related rules, including maximum heights, maximum floor area ratios and maximum lot coverage, I found it hard to show all of these codes at the same time in a succinct and clear way. Therefore, I decided to just diagram the maximum heights rules of the three sites. The other associated rules will be introduced by text.

3.4. Bird's Eye View Photos

Bird's eye view photos are clipped from Google Map. They will be used for comparison of maximum height rules and for overall views of the three case study sites.

3.5. Diagrams of Day and Night Activity

A critical feature of successful MXDs is that they are activated in both day time and night time. These diagrams are generated from the current land use diagrams: office and industrial are day time uses; residential is night time use; and retail and service uses are counted as both day and night uses.

3.6. Diagrams of Open Spaces

In order to show the open space pattern of the case study sites, I selected a focus area that includes their major residential areas. This is becasue open spaces are particularly important for residents in MXDs. I clipped the aerial view photo of them and, to show their open spaces, emphasized the green color using Photoshop. It is because open spaces usually include trees, and there is no plaza type open spaces within the three case study sites.

Chapter IV: Case Study

In this chapter, I will first introduce the backgrounds of the three case studies sites in terms of their geographic characters and their recent mixed-use related histories. Then, I will use diagrams to discuss and analyze their mixed-use related regulations and the current situations.

4.1 BACKGROUNDS OF CASE STUDY SITES

4.1.1. North Pearl District (Portland, Oregon)

Boundary

North Pearl District (NPD) is situated at the center of Portland, at the west side of the Willamette River and just north of Downtown Portland. According to North Pearl District Neighborhood Plan (NPDNP), the district occupies the area north of Lovejoy St. of the Pearl District.[125] Besides being located on the river bank, there is a railroad passing through NPD, which influences the landscapes and land uses of NPD. The boundary of NPD, which is defined by the NPDNP, is shown in the following figure (Figure 6).

[125] City of Portland, Bureau of Planning, *North Pearl District Plan*, Adopted by Portland City Council: November 5, 2008, Ordinance No. 182319 (Portland, 2008), 3

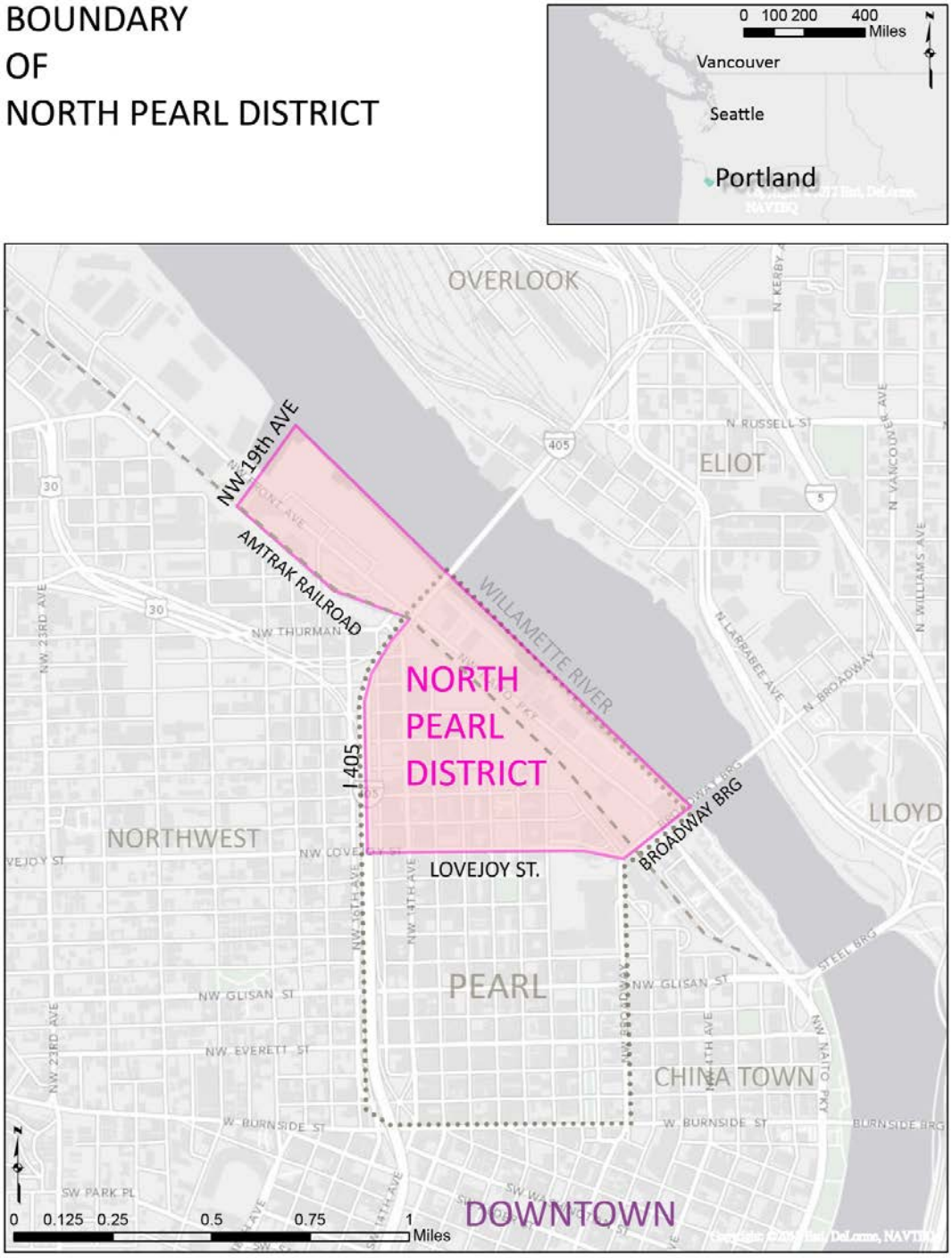

Figure 6: Boundary of North Pearl District

Development Trends

The Pearl District was once primarily occupied by industrial buildings and warehouses in order to accommodate goods brought to Portland by rail.[126] The District has been transformed from railyard and industrial district to a vibrant mixed-use residential since the Central City Plan District (CCPD) became effective in 1992[127] and the Pearl District Development Plan was adopted by the City Council in 2001.[128] In the same period, while auto-detailing shops and hardware stores remained in the late twentieth century, the low rent and large spaces available in empty warehouses ware attractive to art gallery openers.[129] As a result of the zoning codes in the 1992 CCPD, many parcels were zoned for both residential and industrial use, and starting in the late 1990s, some warehouses began to be transformed into condominiums with a design that generally reflects respect for the area's industrial past.[130]

According to the NPDNP, after the revitalization, the first generation residents of the district consisted primarily of young working professionals and some of the so-called "creative class" and "empty nesters." In recent years, the first generation residents are beginning to have children, further transforming the districts to a more family-oriented community.[131]

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126 Bart King, *An Architecture Guidebook to Portland*, (Corvallis: Oregon State University Press, 2007), 158

127 City of Portland, *Municipal Code*, "Title 33 Planning and Zoning, Chapter 33.510 Central City Plan District" (Portland: 2010), 510-1

128 Pearl District Business Association, "History of the Pearl," *Pearl District Business Association*, Retrieved: February 1st, 2013, http://explorethepearl.com/community/history-of-the-pearl/

129 King, *An Architecture Guidebook to Portland*, 158

130 Ibid

131 City of Portland, Bureau of Planning, *North Pearl District Plan*, Adopted by Portland City Council: November 5, 2008, Ordinance No. 182319 (Portland, 2008), 8-10

The Pearl District Business Association states that the revitalization of the Pearl District is critical not only for the district but for the Portland City's housing strategy and growth management. This is because the character of high-density urban neighborhood in the Pearl District has helped relieve pressure to expand the urban growth boundary and protect rural resource lands.[132]

4.1.2. South Lake Union (Seattle, Washington)

Boundary

South Lake Union (SLU) is located at the geographic center of Seattle, at the south tip of Lake Union, west of Capitol Hill and north of Downtown Seattle. Also, Lake Washington lies to the east of Lake Union, and Puget Sound to the west. Based on the South Lake Union Neighborhood Plan (SLUNP), the boundaries of SLU are Denny Way on the south, Aurora AVE on the west, Eastlake Ave on the east and the Lake Union on the North (Figure 7).[133]

Different subareas within SLU have different development types because of the influences of their locations. For example, the Cascade Neighborhood located on the west side of SLU near Capitol Hill, is a mixture of business and residential with many housing types and social services while the uses around the Waterfront area are mainly related to the lake activity.[134]

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[132] Pearl District Business Association, "History of the Pearl," *Pearl District Business Association*, Retrieved: February 1st, 2013, http://explorethepearl.com/community/history-of-the-pearl/

[133] City of Seattle, Department of Planning and Development, *The South Lake Union Neighborhood Plan*, September, 2007, (Seattle, 2007), 10

[134] Ibid, 11 and 14

BOUNDARY
OF
SOUTH LAKE UNION

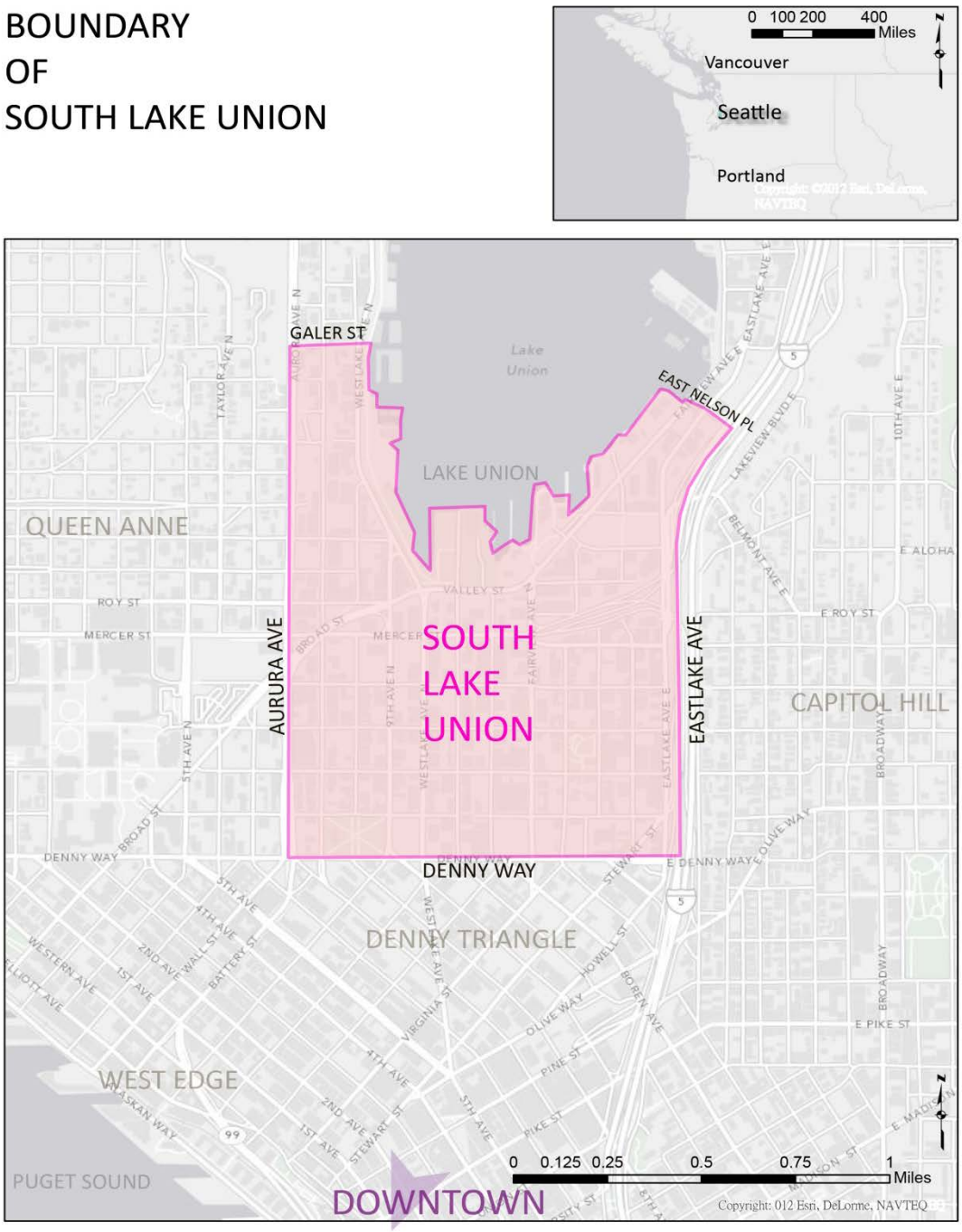

Figure 7: Boundary of South Lake Union

Development Trends

According to the 1998 SLUNP, SLU is one of the few places left in the City where the mix of uses that was commonly found at the turn-of-the-century city still exist. Even before the mixed-use development trend in recent decades, residents in SLU coexisted with small manufacturing and service businesses.[135]

A small amount of residential uses did exist in the Cascade Neighborhood of SLU, but in the early 1990s it mostly consisted of auto-oriented commercial and light industrial uses.[136] Because of the implementation of the 1998 SLUNP and the effectiveness of Seattle Mixed Zone in the municipal codes in 1996, the SLU has shifted to a mixed use urban center.[137] Since then, the SLU has an increasing number of retail stores, restaurants and housing. Nowadays, the primary industries in the district are biotechnology, information technology, as well as many prominent companies such as Amazon.com.

The population in SLU has grown, from 677 in 1990 to 3738 in 2010 -an average 18% growth rate.[138] With the population growth, the building height has grown as well. In 1998, the neighborhood was dominated by two- to four- story buildings, but when the 2007 South Lake Union Neighborhood Plan was written, six- to eight- story buildings became common, and some of the twelve stories buildings were already under construction.[139]

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135 City of Seattle, Department of Planning and Development, *The South Lake Union Neighborhood Plan*, December, 1998, (Seattle, 1998), 10

136 Berk and Heartland, *Public and Private Investment in South Lake Union*, Prepared for City of Seattle's Office of Economic Development, (Seattle, 2012), 5-6

137 Ibid, 18

138 Ibid, 6

139 City of Seattle, Department of Planning and Development, *The South Lake Union Neighborhood Plan*, September, 2007, (Seattle, 2007), 14

According to the Lake Union Historical Walking Tour, the idea of developing SLU as a neighborhood with high-tech laboratories, condos, bistros, and tree-lined promenades was first proposed in the Seattle Commons, by architect Fred Bassetti and columnist John Hinterberger in 1991. The plan entailed substantial public cost to turn the working-class neighborhood to an "urban village." However, the Seattle voters rejected the Seattle Commons levy on 1995 as well as another smaller scale Commons levy on 1996. Although the Seattle Common failed at the polls, it did successfully draw public attention to the possibility of SLU, and indirectly promoted the 1998 South Lake Union Neighborhood Plan.[140]

4.1.3. False Creek North (Vancouver, BC, CA)

Boundary

According to the False Creek North Official Development Plan (FCNODP), False Creek North (FCN) is situated at the north central side of Vancouver, on the south bank of downtown peninsula. The north and east district connected to FCN is downtown Vancouver, the east district connected to it is Strathcona and the False Creek lies to the south side of FCN. There is no "one" specific street defining the north boundary of FCN but the Pacific Boulevard and Beatty Street are the two major streets define the north side of FCN. The west boundary of it is Granville street, the east boundary of it is Quebec street and the south boundary is the False Creek (Figure 8).[141]

FCN is full of activity spaces including the BC place stadium on the east side and Coopers Park, David Lam Park and George Wainborn Park on the south side of FCN.

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[140] History Link Organization, "Lake Union Historical Walking Tour," *History Link Organization*, Retrieved: February 3rd, 2013, http://www.historylink.org/cybertour/pdf/luwalkingtour.pdf bid

[141] City of Vancouver, *False Creek North Official Development Plan*, Adopted by By-law No. 6650, April 10, 1990 (Vancouver, 1990), 18

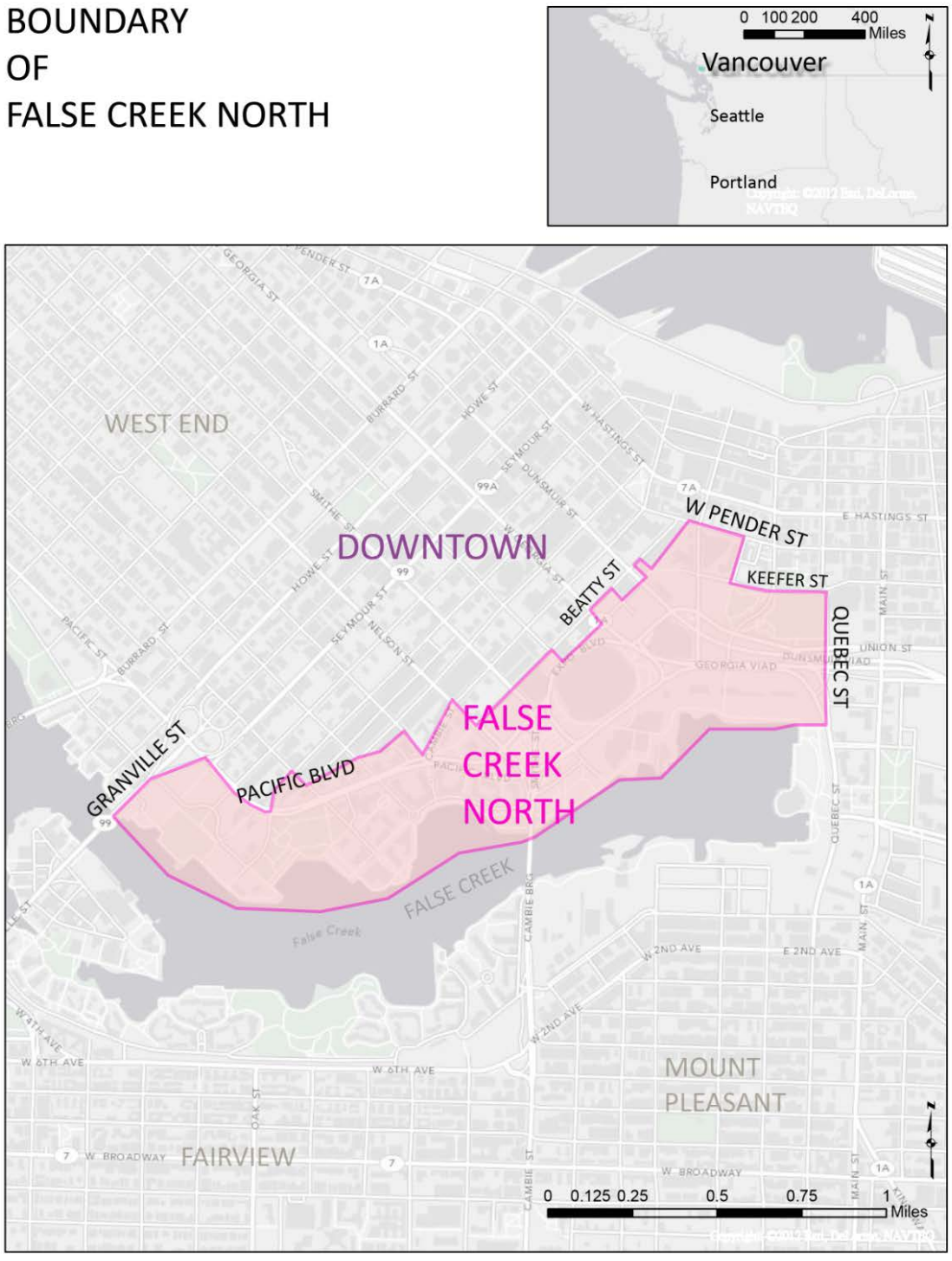

Figure 8: Boundary of False Creek North

Development Trends

Before the Expo '86 World's Fair, FCN was mainly occupied by industrial uses but those industries were cleared entirely for the Expo '86.[142] After the Expo, the provincial government sold the lands to the Concord Pacific development group[143] and the area was mainly rezoned to Comprehensive Development district, which promotes mixed-use land uses.

The new development in FCN by Concord Pacific explored a high-density and high-rise residential style. By selling some of the land to the municipality for affordable and seniors housing, FCN was able to integrate various housing choices.[144] In total, the development in FCN added more than twenty thousand new residents in downtown Vancouver.[145] It is also a neighborhood with sufficient civic amenities: it includes 42 acres of public park space, a continuous waterfront walk and bike way, and 25% family-oriented housing, 20% non-market housing, two elementary schools, four daycare centers and a community centre.[146] It is called "the largest urban redevelopment project in recent North American history."[147]

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142 The Challenge Series, "False Creek's Ecological + Industrial History," *The Challenge Series,* Retrieved: February 6th, 2013, http://www.thechallengeseries.ca/chapter-01/history/

143 Ibid

144 Don Alexander, *False Creek Urban Heritage Trail Guide Book, NewCity Institute,* Retrieved: February 6th, http://newcity.ca/Pages/false_creek_trail.pdf

145 Ibid

146 The Challenge Series, "False Creek's...History," *The Challenge Series*

147 Alexander, *False Creek ... Trail Guide Book, NewCity Institute*

4.2. MIXED-USE RULES ANALYSIS

In the following paragraphs, these topics will be discussed and analyzed: 1. General Zoning and Design Rules, 2. Ground Level Land Use and Design Rules, 3. Open Space Rules and 4. Other Rules (including Live-work Rules, Parking Rules, Nuisance Rules and Affordable Housing Rules).

- Mixed-Use Rules Analysis
  - General Zoning and Design Rules
    - General Zoning/Land Use Rules
    - General Design/Density rules
  - Ground Level Land Use and Design Rules
  - Open Space Rules
  - Other Mixed-Use Developments Related Rules
    - Live-work Rules
    - Nuisance Rules
    - Parking Rules
    - Affordable Housing Rules

Table 7: The Structure of Mixed-use Rules Analysis

4.2.1. General Zoning and Design Rules

In this section, first of all, I will discuss general zoning/land use rules of the three case study sites and the current land use situations of the them, talking about how those different regulation systems shape and influence the actual land uses. Second, the general design/density rules of the three sites will be discussed. I assume that the higher maximum density and the simpler rules may promote the development of new MXDs. Third, "mix of time" is another critical perspective of MXDs so I drew three sets of day and night activity maps to show and analyze the mix of time of the three sites.

1) General Zoning/Land Use Rules

As discussed in Chapter 2.3 Regulation Issues of Mixed-use Developments, there are basically six regulatory tools for MXDs: 1) mixed-use zoning district, 2) overlay district, 3) planned unit development, 4) specific plan, 5) performance standard and 6) form-based codes.

The three cities have very different development regulation systems: NPD, Portland has mixed-use zoning district, overlay zoning districts and specific plan; SLU, Seattle has mixed use zoning district listing prohibited uses instead of permitted uses; FCN, Vancouver has mixed use zoning district and specific plan which regulates land development subarea by subarea with some essence of form-based codes and was made by the partnership of public and private sectors.

Figures 9 to 11 show their official zoning regulations. From the way those rules were coded, one can observe the different regulation systems discussed in the previous paragraph. In Figure 9, Portland: layer by layer zoning system, those zones are showed as "Base Zone-Overlay District-Plan District." The local level "plan district" overrides the basic zone and other overlay zones. We can see that NPD is mainly surrounded by commercial, employment and industrial districts. Basically, the Employment districts allow mixed uses, including residential, commercial and industrial uses. In sum, in NPD and its surrounding area, the permitted land uses are wide-ranging and very flexible.

In Figure 10, we can see that in Seattle, the maximum height requirements and land uses rules are separated instead of one zone dedicated to one set of development standards; in Seattle, the same zones may have different maximum height limitations with different FAR and other density related requirements. The other special factor in Seattle's land use regulation is that it lists prohibited uses rather than permitted uses: all

of the uses are permitted outright. In Figure 10, we can observe that on the east side of SLU, the lands are primarily dedicated to multifamily zones; the areas on the south side of it are downtown mixed use/commercial districts; the lands on the west side of it are designated to commercial, multifamily and single family uses. SLU looks like a transition area linking residential, commercial and the waterfront recreational uses together.

Figure 11 shows the official zoning districts in FCN, Vancouver and its adjacent areas. From it, we can hardly tell what uses are allowed and what are the maximum heights of those areas- Vancouver rules the land uses subarea by subarea, one can only find the permitted uses and other rules within each set of the zoning codes. But generally, the FCN and downtown Vancouver are all designed for mixed uses.

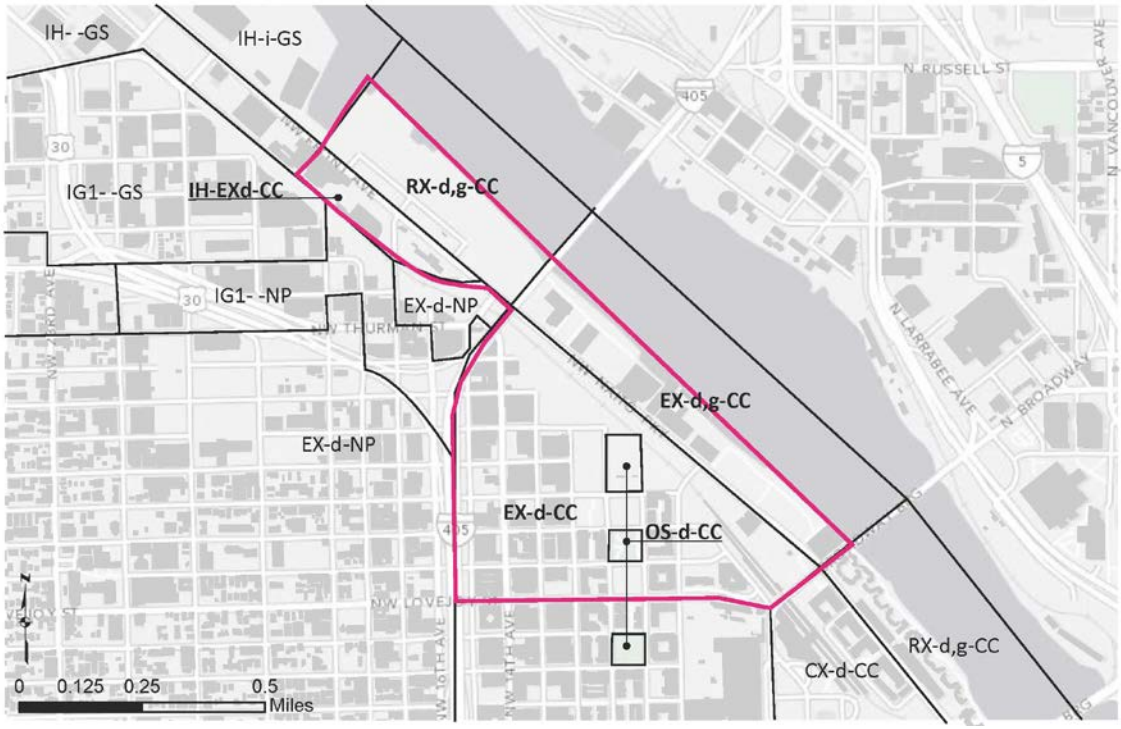

Figure 9: NPD Official Zoning Districts

(**RX**: Central Residential Base Zone, **EX**: Central Employment Base Zone, **IH**: Heavy Industrial Base Zone, **OS**: Open Spaces, **CX**: Central Commercial Base Zone, **IG1**: General Industrial 1 Base Zone, **d**: Design Overlay Zone, **g**: River General Overlay Zone, **i**: River Industrial Overlay Zone, **CC**: Central City Plan District, **NP**: Northwest Plan District, **GS**: Guild's Lake Industrial Sanctuary plan district)

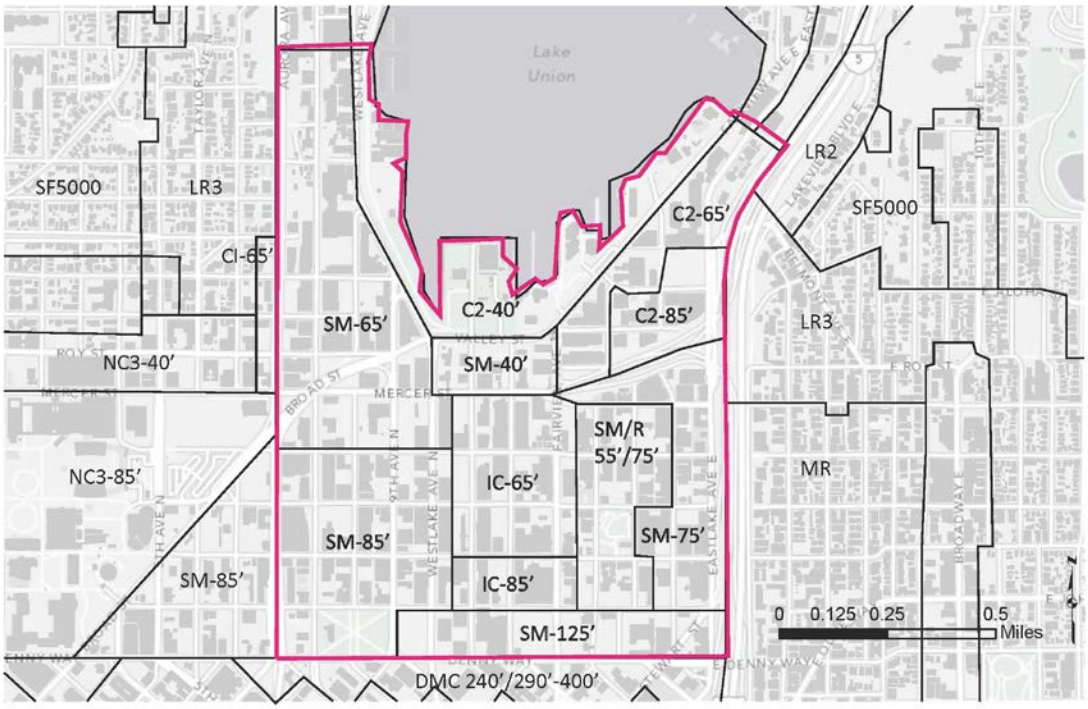

Figure 10: SLU Official Zoning Districts

(**SM**: Seattle Mixed, **SM/R**: Seattle Mixed Residential**, C2**: Commercial 2, **IC**: Industrial Commercial, **DMC**: Downtown Mixed Commercial, **MR**: Midrise Multifamily Residential, **LR3**: Low-rise 3 Multifamily Residential, **LR2**: Low-rise 2 Multifamily Residential, **SF 5000**: Single Family 5000 Residential, **NC3**: Neighborhood Commercial 3, **CI**: Commercial 1)

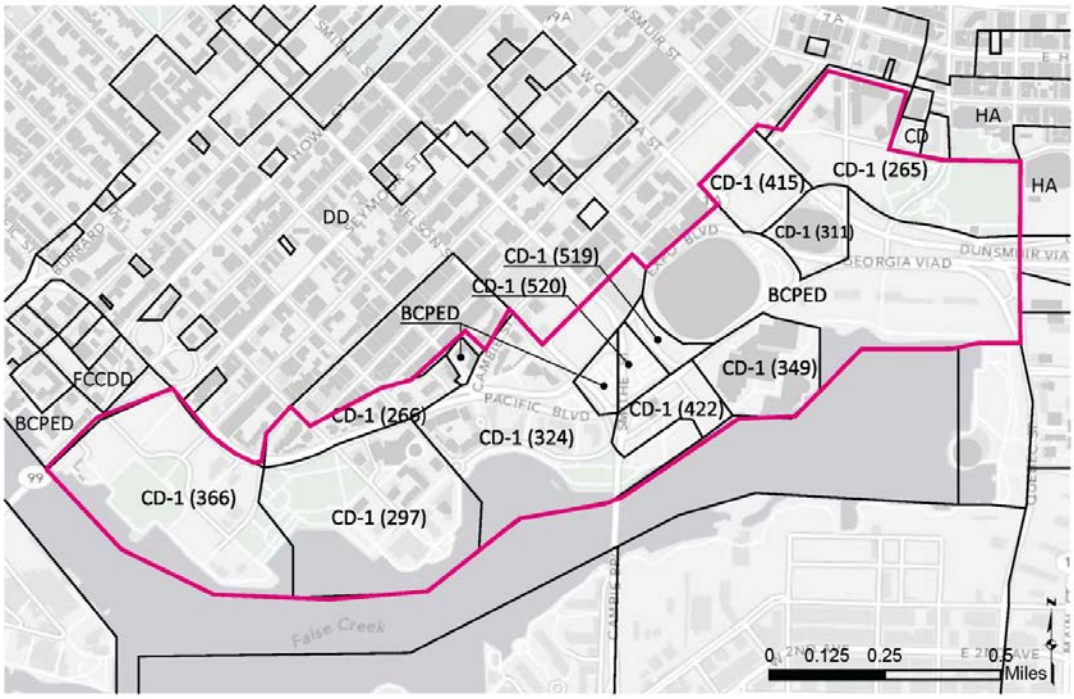

Figure 11: FCN Official Zoning Districts

(**CD**: Comprehensive Development District, **BCPED**: Comprehensive Development District False Creek North Side, **FCCDD**: Comprehensive Development District False Creek South Side, **DD**: Comprehensive Development District Downtown, **HA**: Historic Area District)

Figures 12, 14 and 16 are the generalized land use rules of the three sites, and Figure 13, 15 and 17 are the existing land use patterns of them. Figures 18 to 23 are the day/night time activity maps of them. These comparisons are intended to help understand how rules translate to land uses on the ground.

Within the three cases, generally, NPD has the most mixed land uses (Figure 13): employment uses and residential uses are very close. In NPD, ground floor commercial with housing uses above are very common. In addition to vertical mixed uses, NPD is still highly mixed in terms of horizontal, shared premise, or time (Figure 18 and 19),

compared to the other two sites. I think it is because City of Portland intentionally promotes residential uses in NPD, a former industrial and commercial site, by the codes of the Central City Plan District. The residential uses are encouraged mainly by the floor area bonuses. Basically, the floor area ratio in NPD is between 2:1 and 5:1, but it may increase to 9:1 by floor area bonuses and transfers from other sites.[148] The residential bonus floor area ratio option is: for each square foot of floor area developed and committed as housing, a bonus of 1 square feet of additional floor area is earned, up to an additional floor area ratio of 2:1.[149] For comprehensively creating a place where people can both live and work, the family and community oriented facilities are also encouraged by bonus floor areas: for each square foot of day care, a bonus of 3 square feet of additional floor area is earned;[150] moreover, many neighborhood facilities are not counted towards maximum FAR for the site, including: schools, libraries and public community centers.[151]

In the middle of the three sites, FCN's existing land uses look the most similar its zoning map (Figure 16 and 17). In other words, the land uses highly correspond to its zoning rules. Looking into each of the zoning by-laws and the False Creek North Official Development Plan (FCNODP), one can find that every site in FCN is coded with very detailed restrictions. Every zone, such as CD-1(366) or CD-1(297), has its own zoning by-laws which usually start with a set of intentions. Following these intentions, there are land uses regulations: the permitted land uses, and the location and amount (maximum/minimum floor area or units) of some uses. For example, in CD-1(324), the

148 City of Portland, *Municipal Code*, "Title 33 Planning and Zoning, Chapter 33.510 Central City Plan District, 33.510.200 Floor Area Ratios" (Portland: 2010), 510-19 to 510-30

149 City of Portland, *Municipal Code*, "Title 33 Planning and Zoning, Chapter 33.510 Central City Plan District, 33.510.210 Floor Area and Height Bonus Options" (Portland: 2010), 510-31 to 510-40

150 Ibid

151 City of Portland, *Municipal Code*, "Title 33 Planning and Zoning ... 33.510.200 Floor Area Ratios" (Portland: 2010), 510-19 to 510-30

maximum amount of dwelling unit is 2,571 units (up to 221,183 square meters); the maximum amount of retail, service and office uses is 33,822 square meters; and the maximum live-work uses is 788 square meters, which should have access to grade at Pacific Boulevard or Coopers Mews.[152] In the entire FCN area, the maximum amount of dwelling units is 10,154 units with a total floor area up to a maximum of 946,417 square meters; the maximum amount of office, retail and service uses is 201,820 square meters.[153] These permitted land uses as well as their density and location were decided by the cooperation and negotiation between public and private sectors.[154] After the Expo '86 World's Fair, almost the whole area of FCN was sold to a private developer-Concord Pacific. This developer was expected to pay all the costs of city's planning and regulatory work, which allowed the creation of a team of city officers (including planners, engineers and etc.) to work across developments alongside the developers and their designers.[155] The land use regulations discussed previously are all the products of this private and public sector cooperation. The author of The Vancouver Achievement comments "these principles of collaborative and corporate planning were of critical importance to eventual success of the megaproject."[156]

Overall, the land use pattern of FCN is focusing on high-rise residential uses with street oriented retail uses; around the B.C Stadium and the north east side of FCN these uses are more mixed in terms of vertical, horizontal and time dimension (Figure 17, 22 and 23).

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152 City of Vancouver, *Zoning and Development By-law*, "CD-1(324) 800-1100 Pacific Boulevard By-law No. 7248," November 30, 1993 (Vancouver, 1993)
153 City of Vancouver, *Zoning and Development By-law*, False Creek North Official Development Plan By-lay No.6650
154 John Punter, *The Vancouver Achievement- Urban Planning and Design* (Vancouver: UBC Press, 2003), 195
155 Ibid, 196
156 Ibid

Opposite of the mostly residential mixed-use in FCN, SLU in Seattle puts more focus on employment uses, including office, industrial and researching uses (Figure 14). The central part of SLU allows only commercial and low-impact industrial uses and the north east side of it allows only commercial use while the remaining area allows both commercial and residential uses. Looking into its' existing land use map, SLU looks more like an employment center with some apartments scattered throughout (Figure 15).

Besides uses restrictions, the land use codes also provide some incentives to encourage certain uses in certain area of SLU. In the SM-65' zone (Figure 10), the maximum building heights are extended from 65 feet to 120 feet for the structures designed for research and development laboratory use and administrative office associated with research and development laboratories.[157] The other incentive rule is in the SM/R zone (Seattle Mixed Residential), where structures with 60 percent or more of the structure's gross floor area as residential use are permitted to a height of 75 feet.[158] Generally, there are no FAR restrictions for SM or SM/R zones (except SM-85' and SM-125' zones, their maximum FARs are 4.5:1 and 5:1 respectively), so the incentives are provided to allow higher maximum heights instead of offering larger FARs as Portland does.

In general, SLU looks like it is still in transition from a warehouse district to a mixed-use neighborhood with innovative firms. Some places were warehouses with obvious loading facilities (which is unfriendly for pedestrians) and some were still under construction in 2011 based on Google Street View. As for newer constructed buildings, there are some mid-rise apartments in the east side (SM/R) and the northwest area (SM-

[157] City of Seattle, *Municipal Code*, "Title 23 Land Use Code, Chapter 23.48 Seattle Mixed, 23.48.017 Additional height in certain SM-zoned areas in the South Lake Union Urban Center," (Seattle, 2010)
[158] City of Seattle, *Municipal Code*, "Title 23 Land Use Code, Chapter 23.48 Seattle Mixed, 23.48.016 Standards applicable to specific areas," (Seattle, 2011)

65'). Although the SM-65' zone encourages research and development laboratory uses, the uses in 2011 were mostly normal offices, mid-rise apartments, a few restaurants, and a few marine shops. Aside from those innovative firms- Amazon.com and a few hospital/biological research centers which occupy the central and northeast area of SLU..

Figure 12: Land Use Rules of NPD

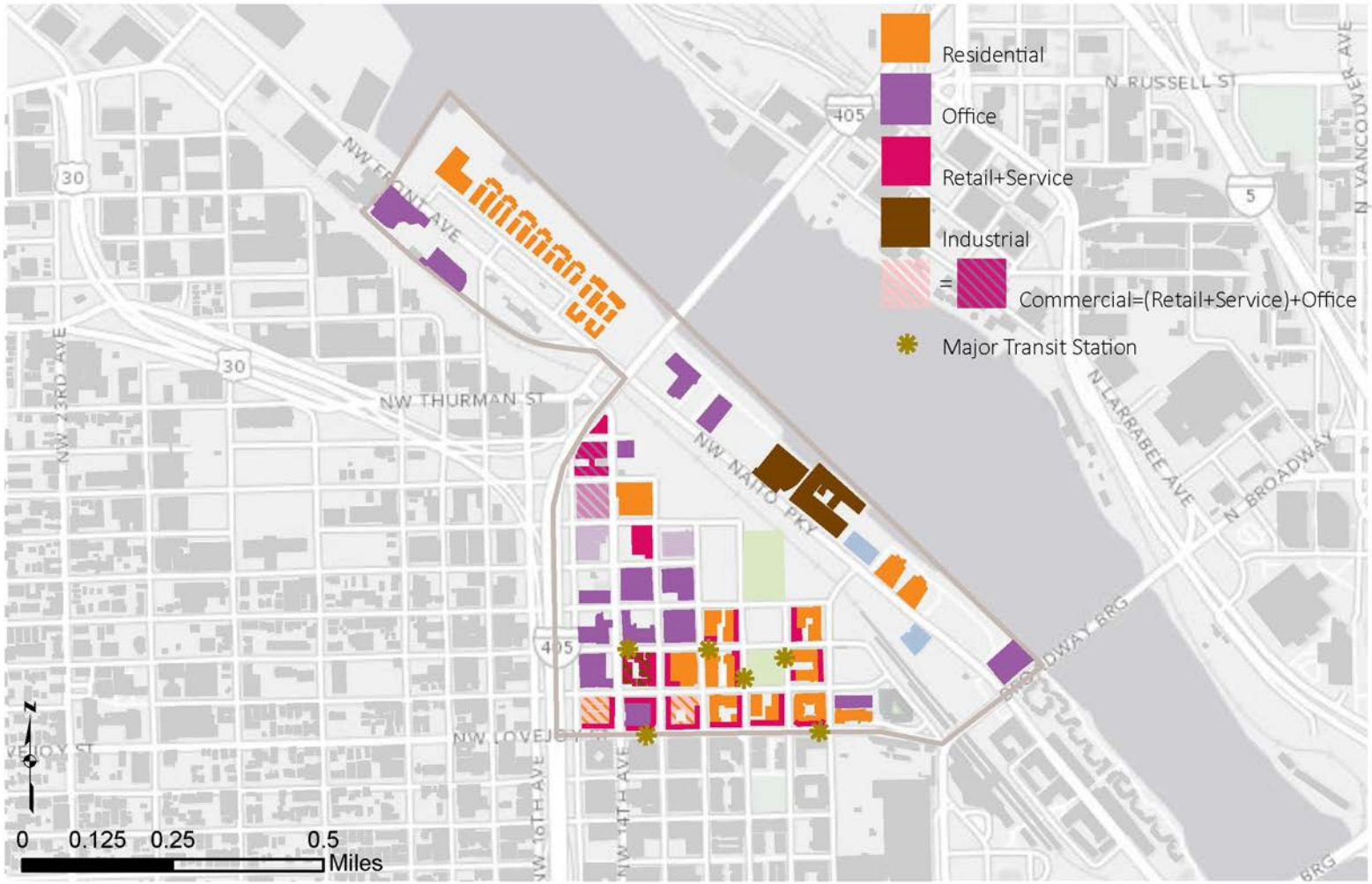

Figure 13: Current Land Use of NPD

Figure 14: Land Use Rules of SLU

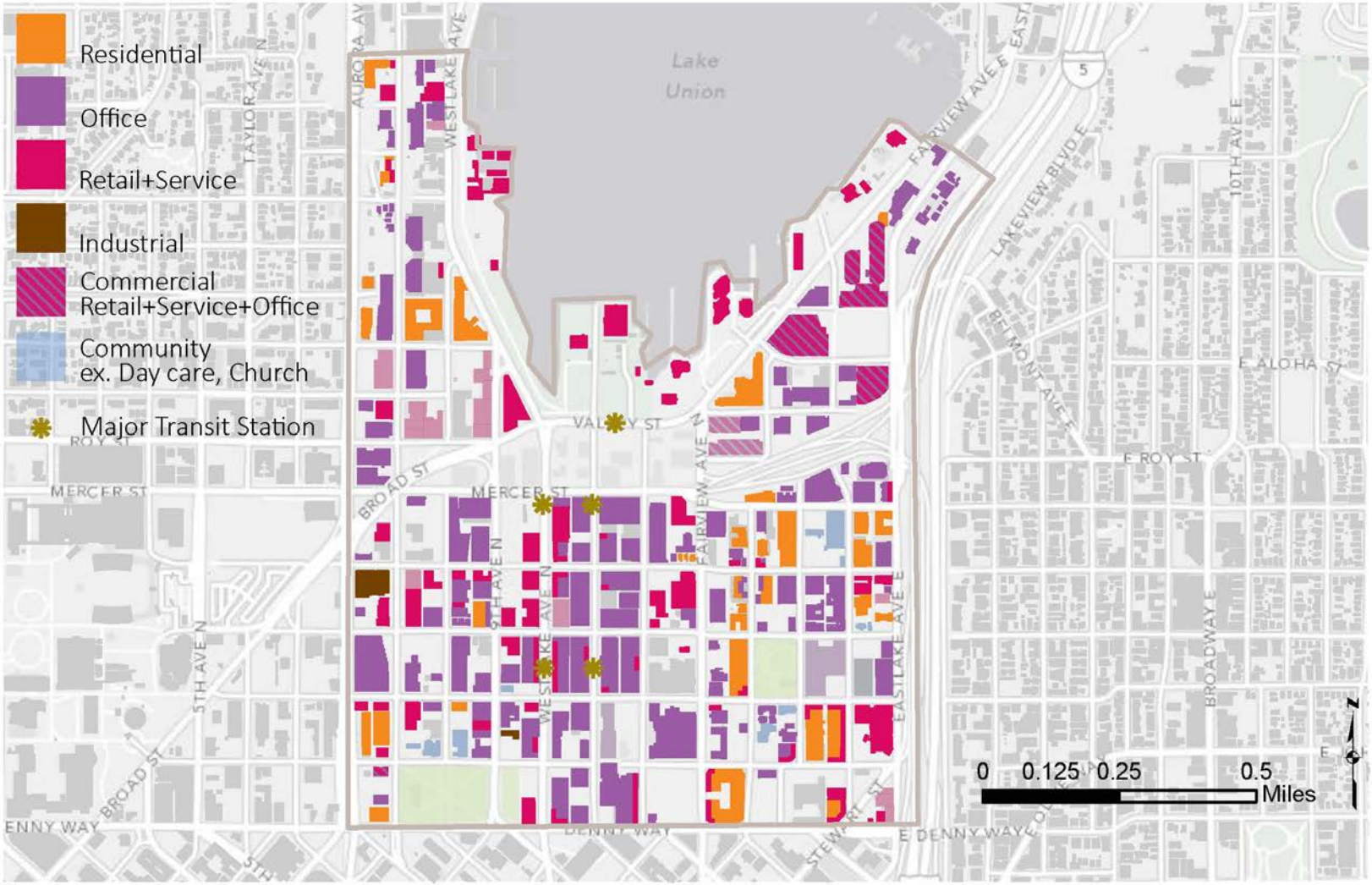

Figure 15: Current Land Use of SLU

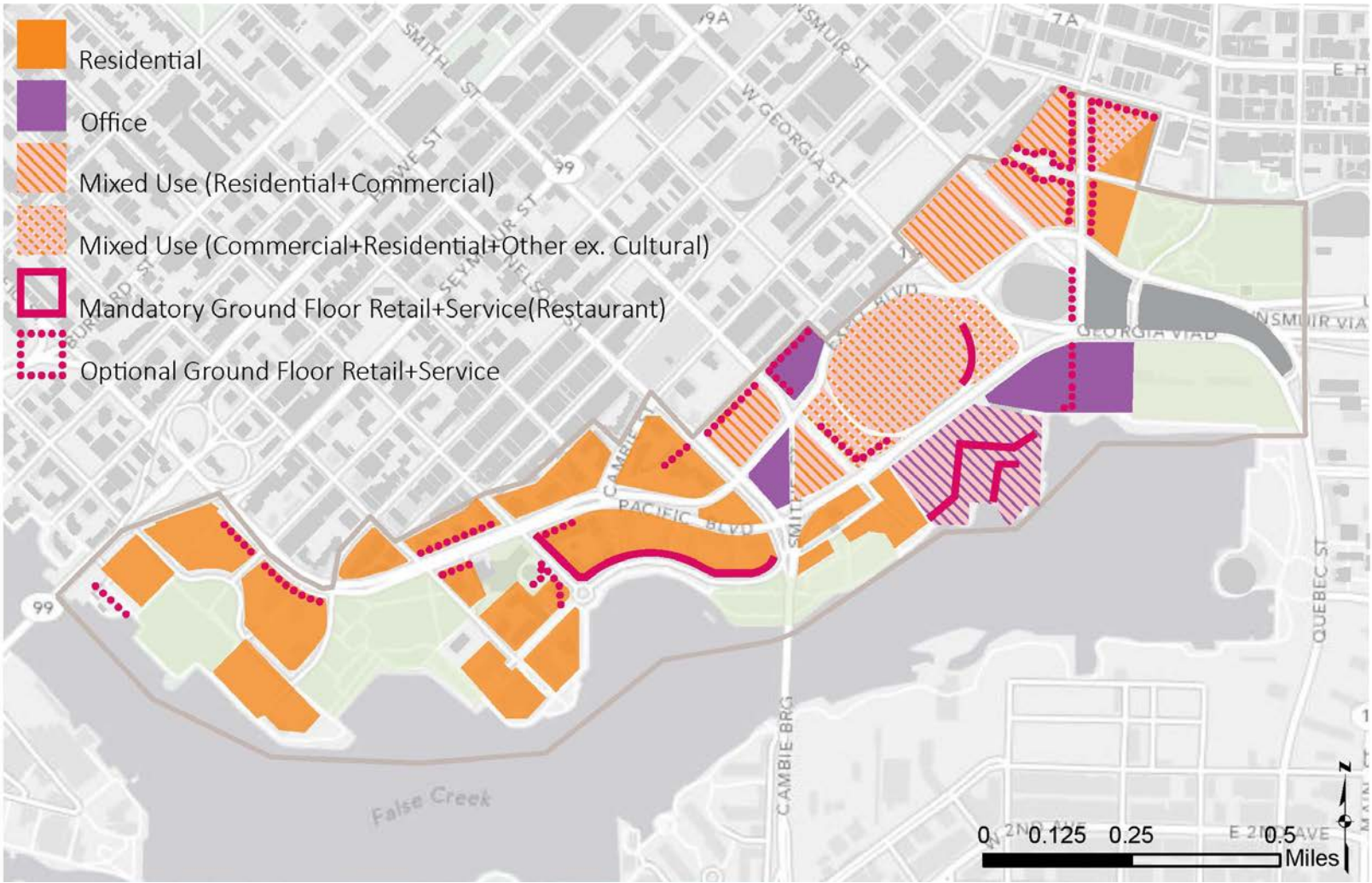

Figure 16: Land Use Rules of FCN

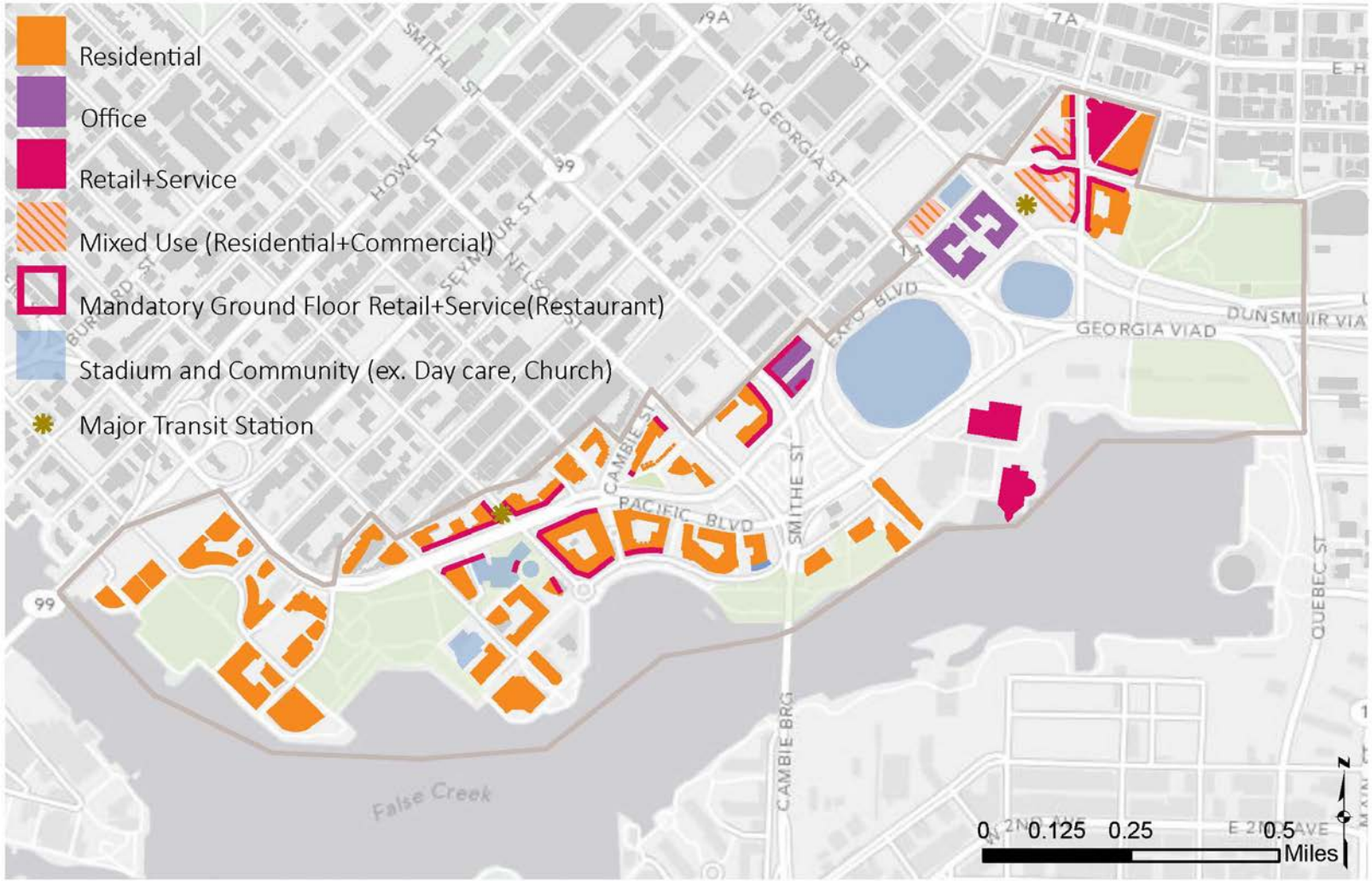

Figure 17: Current Land Use of FCN

Figure 18: Day Time Activity of NPD

Figure 19: Night Time Activity of NPD

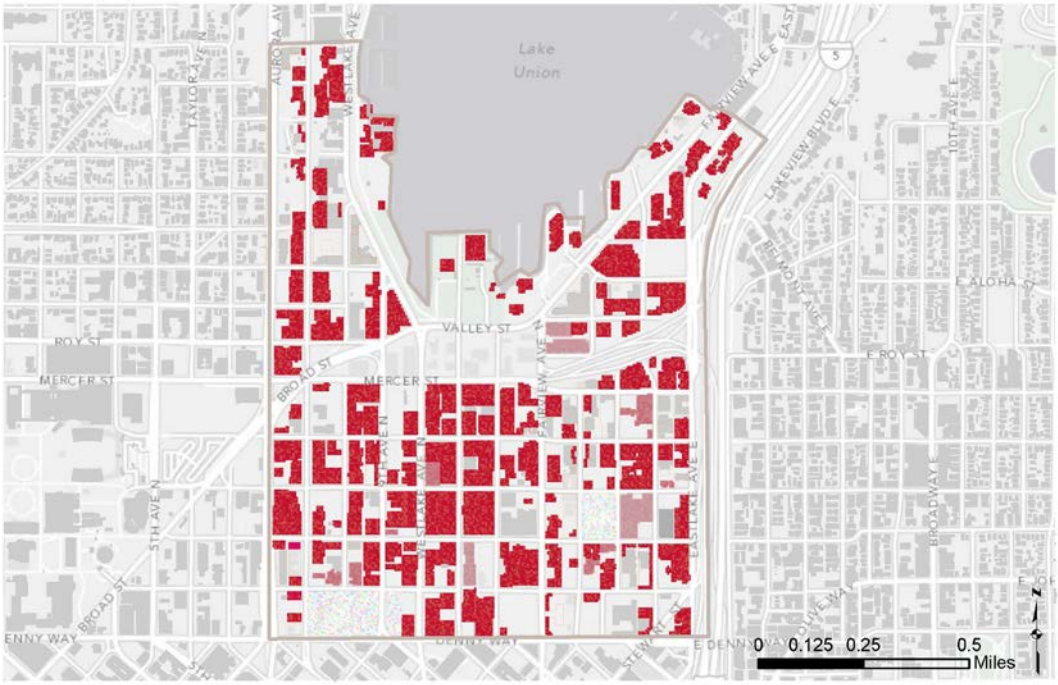

Figure 20: Day Time Activity of SLU

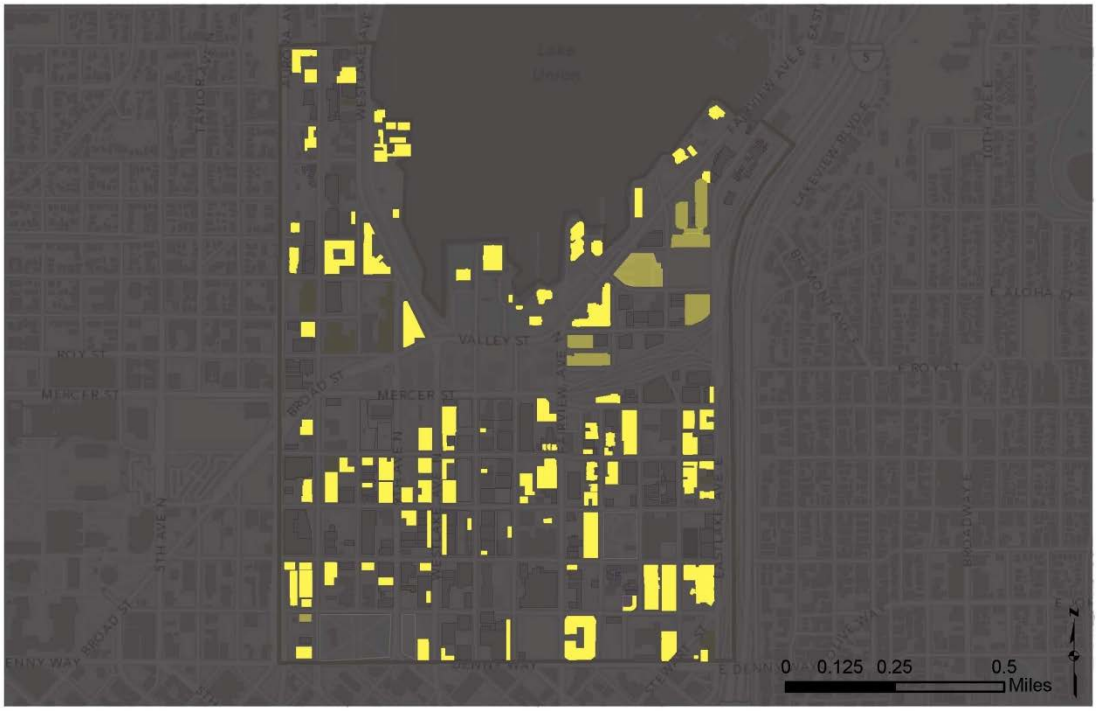

Figure 21: Night Time Activity of SLU

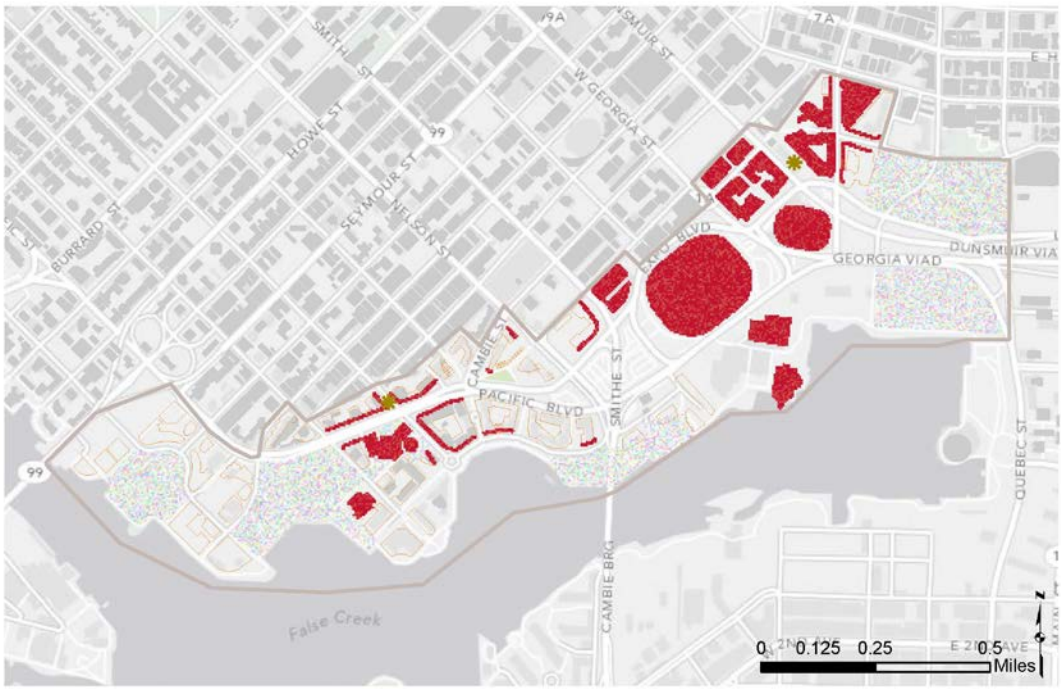

Figure 22: Day Time Activity of FCN

Figure 23: Night Time Activity of FCN

2) General Design/Density rules

Figures 24, 26 and 28 show the maximum height restrictions of the three sites, and Figures 25, 27 and 29 show the bird's eyes views of them. These comparisons are intended to help analyze the density rules and the actual development patterns of the three sites.

In NPD, Portland, the maximum height for most of the area is 100 feet except the lots on the south and west corner of open spaces. The basic maximum FAR is around 4.5:1 in the EX zone (Central Employment, the triangle shape area) and 2:1 in the RX zone (Central Residential, the long stripe areas along the river). Their FARs can be up to 9:1 by adding bonus FAR.[159]

The maximum allowable height in SLU, Seattle, is like a slope: the south side is higher and the north side is lower. When you ignore the additional height bonus discussed in the previous section, these heights are from 40 feet to 125 feet.[160] The FAR for the areas that allow a maximum height of 85 feet or more is around 4.5:1.[161] Overall, the floor area density in SLU is lower than NPD.

In contrast with the flatter development pattern in NPD and SLU, FCN, Vancouver is primarily occupied by point-tower residential buildings and open spaces along the waterfront. The maximum heights are regulated tower by tower instead of lot by lot; the highest maximum height is 360 feet. Considering the large open spaces, the overall floor area density in FCN may not be higher than SLU or NPD.

Overall, based on street view and birds-eye observations of these three sites, I found the newly constructed buildings (which are ruled by the new mixed use

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159 City of Portland, *Municipal Code*, "Title 33 Planning and Zoning, Chapter 33.510 Central City Plan District " (Portland: 2010)

160 City of Seattle, *Municipal Code*, "Title 23 Land Use Code, Chapter 23.32 Land Use Maps," (Seattle, 2001)

161 City of Seattle, *Municipal Code*, "Title 23 Land Use Code, Chapter 23.48 Seattle Mixed" (Seattle)

regulations) are usually located near major transit stations, downtowns and the areas allow denser developments. In addition, although there is no clear statistical data to prove my thought, I would say that higher permitted density and simpler development regulations encourage mixed-use renovation of a district. I observed that NPD allows higher density, has simpler and clearer regulations, and has higher degree of new mixed-use contractures than SLU.

Figure 24: Maximum Height of NPD

Figure 25: Bird's Eyes View of NPD

Figure 26: Maximum Height of SLU

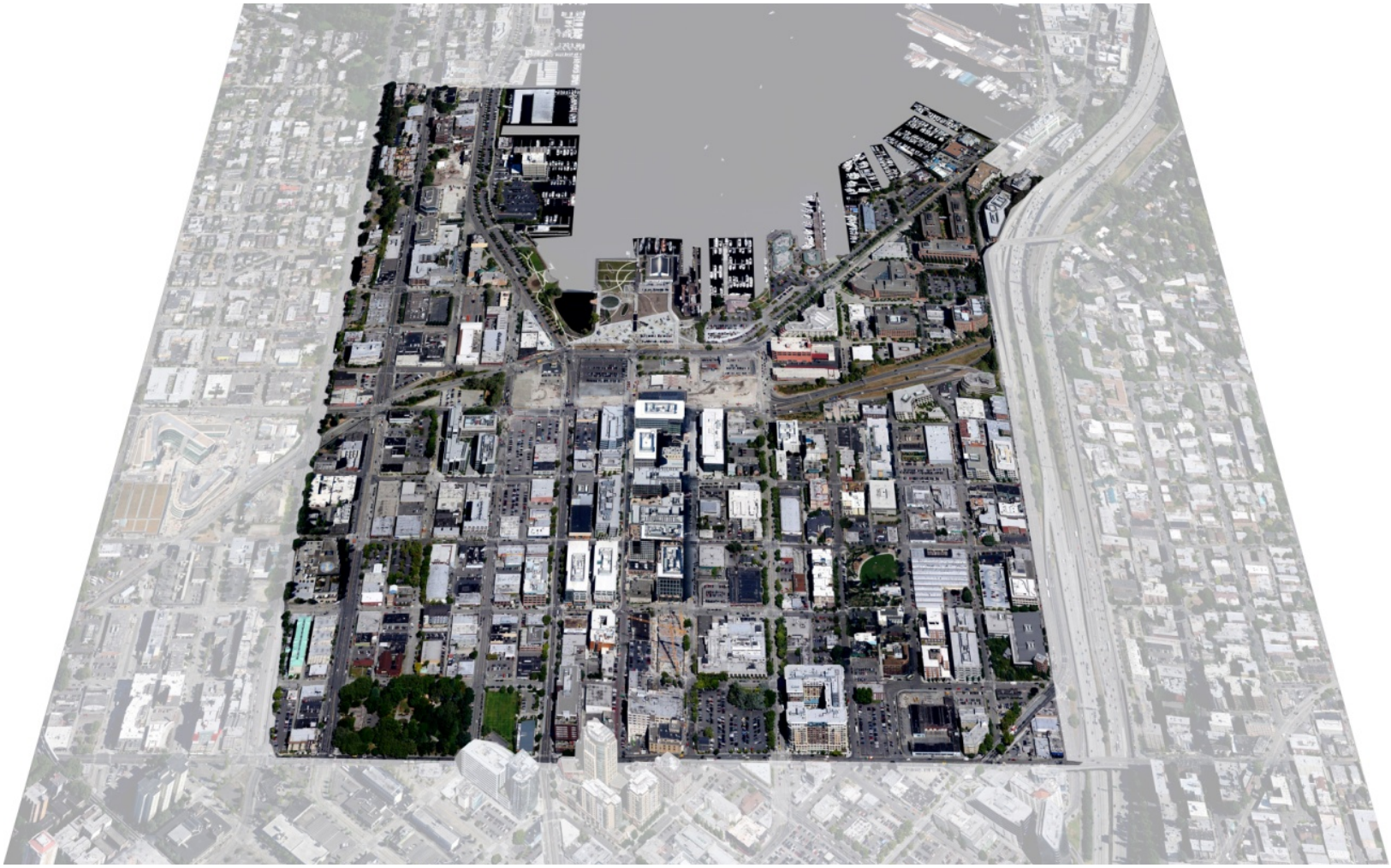

Figure 27: Bird's Eyes View of SLU

Figure 28: Maximum Height of FCN

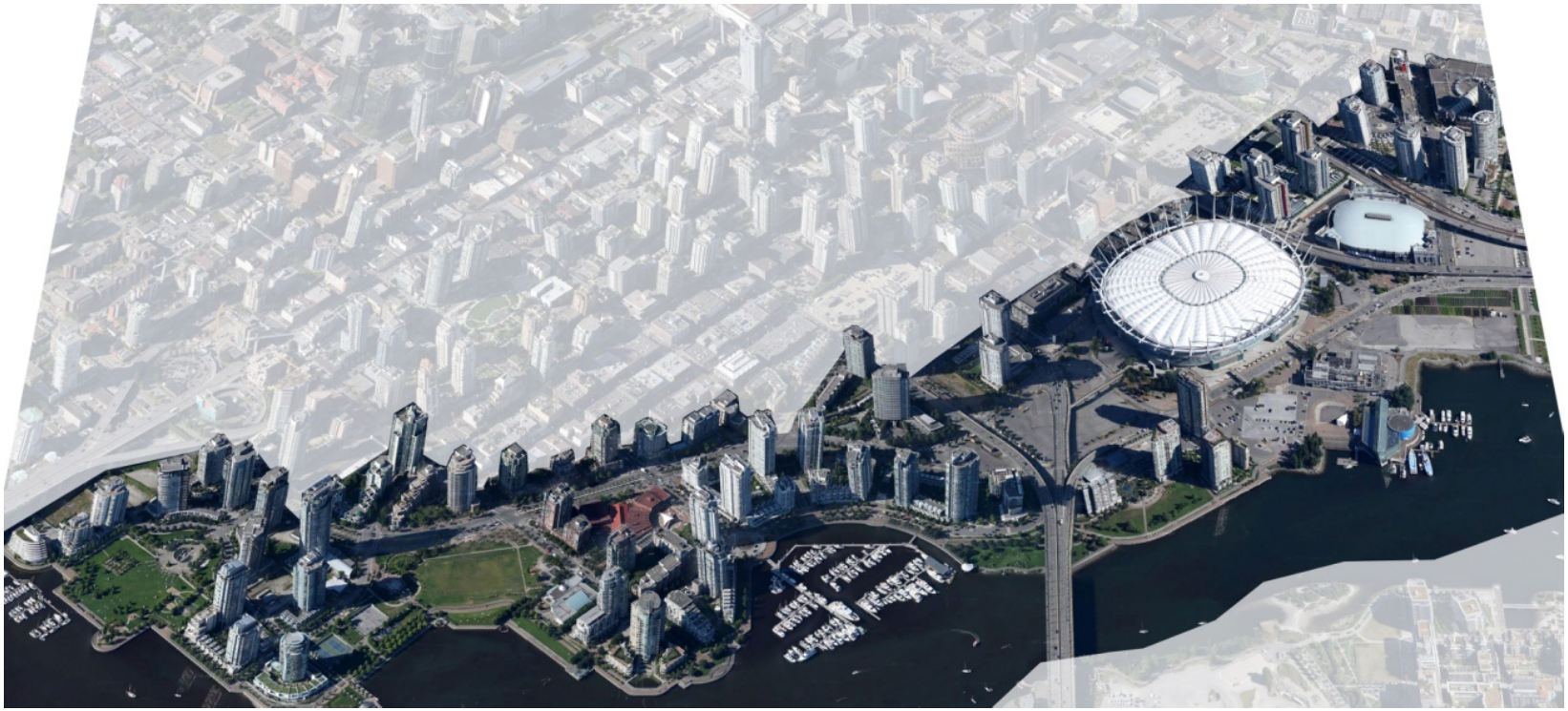

Figure 29: Bird's Eyes View of FCN

4.2.2. Ground Level Land Use and Design Rules

Because one mixed-use building can serve different uses, and because of their requirement of pedestrian-oriented environment, the land use and design of the ground level in MXDs are critical and usually particularly coded.

The three sites all have certain areas that conform to special ground level rules. These rules are usually about 1) building line requirements, 2) ground floor windows/ transparency requirements, and 3) ground level land use restrictions. In Figures 12, 14 and 16 (Page 73-77), you can see the locations regulated by the ground level land use rules as thick red edges; their corresponding existing land uses are in Figures 13, 15 and 17 (Page 74-78). In general, the areas with mandatory ground level retail and service uses are required to meet the other two rules as well.

Most of the ground level related rules are for the red edges in Figures 12, 14 and 16, where the cities have designated them for special street level land uses and designs. Therefore, in the following paragraphs, the discussion will focus on the rules for those areas.

NPD and SLU have similar building line requirements and ground floor windows/ transparency requirements (Table 7). They both require that a certain percentage of structures should be built on the property line and a certain portion of the facade should be transparent. These rules are helpful for creating continuous pedestrian friendly environments by providing diverse pedestrian experiences and encouraging surveillance opportunities. Different from NPD and SLU, FCN, Vancouver has various building line setback requirements tied to the locations and/or land uses which are from 0 to 7.6 meters (25 feet). There are some general ground floor window requirements in the "Design

Guidelines" but these guidelines don't specify what proportion of the facade should be windows.[162]

All of the three sites have some ground level land use restrictions for the specific areas (Table 8). The permitted ground level uses in NPD is the widest within the three sites, which includes residential and office uses; SLU specifically lists some civic uses, while FCN only allows retail and service uses.

	Minimum % that should be built on the street property line	Minimum % of the facade width that should be transparent	Ground level land use restrictions
NPD, Portland	75% (The facade must be at least 15 feet height)[163]	50% of the length (and 25% of the ground level wall)[164]	Lobbies, retail, residential, commercial, and office[165]
SLU, Seattle	70% (The facade must be at least 45 feet height)[166]	60% (apply to the area of the facade between 2 feet and 8 feet above the sidewalk) (Figure XX)[167]	General sales and service uses, eating and drinking establishments, entertainment uses, public libraries, and public parks[168]
FCN, Vancouver	-	-	Retail, service[169]

Table 8: Comparisons of Ground Level Rules

[162] City of Vancouver, *Land Use and Development Policies and Guidelines*, "Quayside Neighborhood CD-1 Guidelines (By-law No. 7248) (CD-1 No.324)," " Roundhouse Neighborhood CD-1 Guidelines (By-law No. 7156) (CD-1 No.297)," and "International Village Guidelines" (Vancouver, 2001; 1993; and 1996)

[163] City of Portland, *Municipal Code*, "Title 33 Planning and Zoning, Chapter 33.510.215 Central City Plan District- Required Building Lines" (Portland: 2010)

[164] City of Portland, *Municipal Code*, "Title 33 Planning and Zoning, 33.140 Employment and Industrial Zones (Portland, 2012)

[165] City of Portland, *Municipal Code*, "Title 33 Planning and Zoning, Chapter 33.510.215 Central City Plan District- 33.510.225 Ground Floor Active Uses" (Portland: 2010)

[166] City of Seattle, *Municipal Code*, "Title 23 Land Use Code, Chapter 23.48 Seattle Mixed, 23.48.014 General facade requirements," (Seattle, 2005)

[167] City of Seattle, *Municipal Code*, "Title 23 Land Use Code, Chapter 23.48 Seattle Mixed, 23.48.018 Transparency and blank facade requirements," (Seattle, 2005)

[168] City of Seattle, *Municipal Code*, "Title 23 Land Use Code, Chapter 23.48 Seattle Mixed, 23.48.019 Street-level uses," (Seattle, 2006)

[169] City of Vancouver, False Creek North Official Development Plan By-lay No.6650

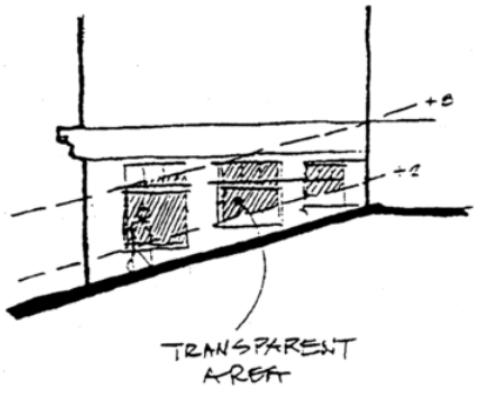

Figure 30: Illustration of SLU's codes: Area where Transparency Requirements Apply to a Structure[170]

In addition to the three basic sets of ground level codes, the three cities also have some rules dealing with pedestrians' circulation. Some of them touch on the issue of separating private and public circulations which is a critical issue in residential - commercial MXDs. Some of them talk about the relationship between buildings' entrances and streets. SLU and NPD both require street-level uses or building entrances to be directly connected the nearest street or open space.[171] In other words, the main entrances of buildings should be obvious for pedestrians and reasonably close to the nearest streets (for example, no more than 20 feet away). FCN requires any development combining residential and other uses to have "separate and distinct means of pedestrian access to the residential component from streets and on-site parking" and "private, semi-private, and public outdoor spaces shall be clearly separated and distinguished from each other."[172] In addition, because of the point-tower feature of

170 City of Seattle, Municipal Code, "Title 23 Land Use Code ... 23.48.018 Transparency and blank facade requirements," (Seattle, 2005)

171 City of Seattle, Municipal Code, "Title 23 Land Use Code ... 23.48.019 Street-level uses," (Seattle, 2006); City of Portland, Municipal Code, "Title 33 Planning and Zoning, 33.140 Employment and Industrial Zones, 33.140.240 Pedestrian Standards (Portland, 2012)

172 City of Vancouver, *Land Use and Development Policies and Guidelines*, "Quayside Neighborhood CD-1 Guidelines (By-law No. 7248) (CD-1 No.324)," "Beach Neighborhood CD-1 Guidelines (CD-1 No.366)," (Vancouver, 2001; and 2002)

FCN, engaging the towers with street-level activity is another critical issue. In the Design Guidelines of FCN, they states that low or mid-rise buildings (ex. lower than 115 feet or 8 stories) should generally define the streets and public spaces while high-rise towers should orient to the established city street grid.[173]

In the following paragraphs, I am going to discuss some observations regarding ground level rules of the three sites.

First of all, all of the three sites incorporate the ground level active uses with existing transit stations. I think following the existing development trends or pedestrian hotspots are important for assigning streets for ground level active uses (Figure 31-33). Without the consideration of other contexts, mandatory or incentivized ground level retail/service uses may result in vacant stores. Generally, as my observation of the street views in Google map in 2011(Portland and Seattle) and 2009(Vancouver), the ground floor store vacancy rates of the three sites are very low (I rarely saw vacant stores or the sign of for lease), and those streets look warm and inviting. However, all of the three sites have banks that occupy a large area of street facades. In contrast with retail and other service uses that operate longer hours, banks and some 9-5 service places may become lifeless places during night times. They may be categorized as service uses, but they can't contribute to street vitality as much as other service or retail uses. Banks especially usually occupy large corner stores with their monotonous facades that abates street vitality even more (Figure 34). I think this problem can be solved by more specified ground level active uses and by limiting the maximum floor area of ground floor retail or service uses.

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[173] City of Vancouver, *Land Use and Development Policies and Guidelines*, "Quayside Neighborhood CD-1 Guidelines (By-law No. 7248) (CD-1 No.324)," "Beach Neighborhood CD-1 Guidelines (CD-1 No.366)," " Roundhouse Neighborhood CD-1 Guidelines (By-law No. 7156) (CD-1 No.297)," and "International Village Guidelines "(Vancouver, 2001; 1993; 2002; and 1996)

Figure 31: NPD Ground Level Active Uses and Transit Stations

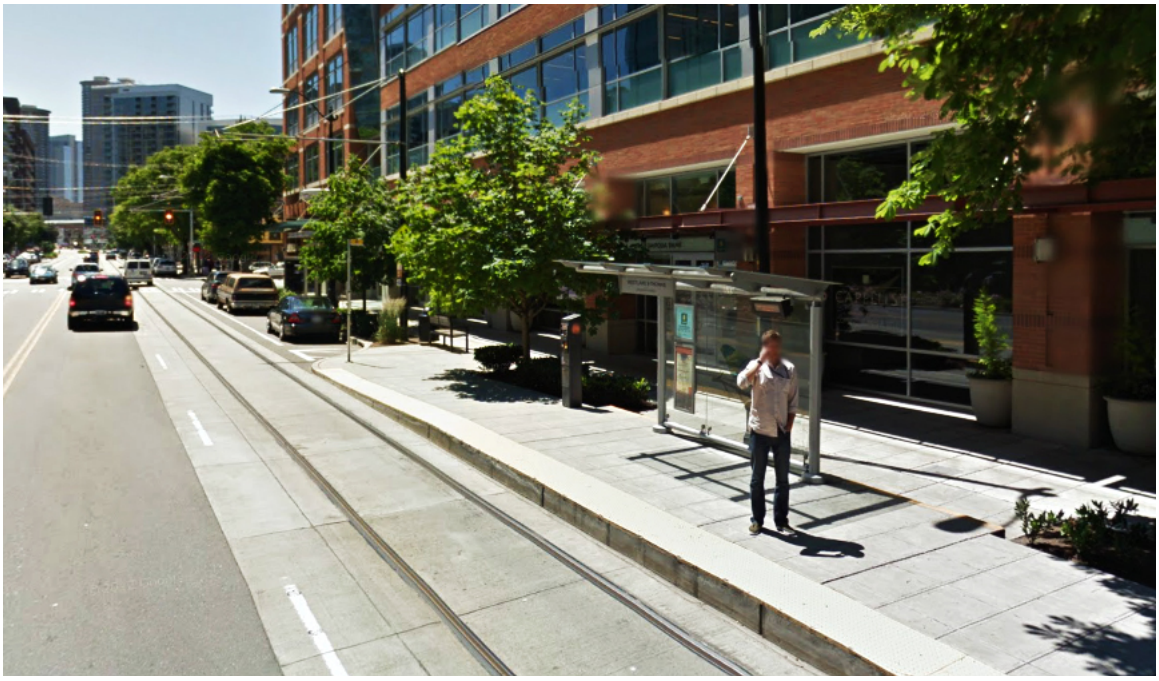

Figure 32: SLU Ground Level Active Uses and Transit Stations

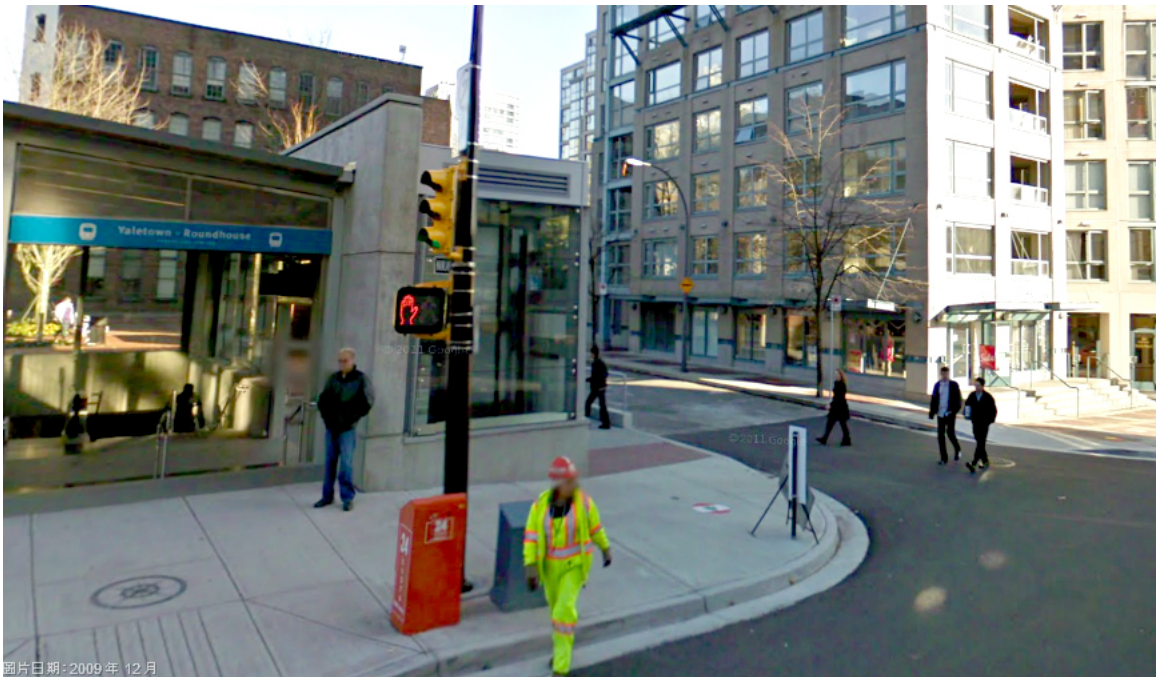

Figure 33: FCN Ground Level Active Uses and Transit Stations

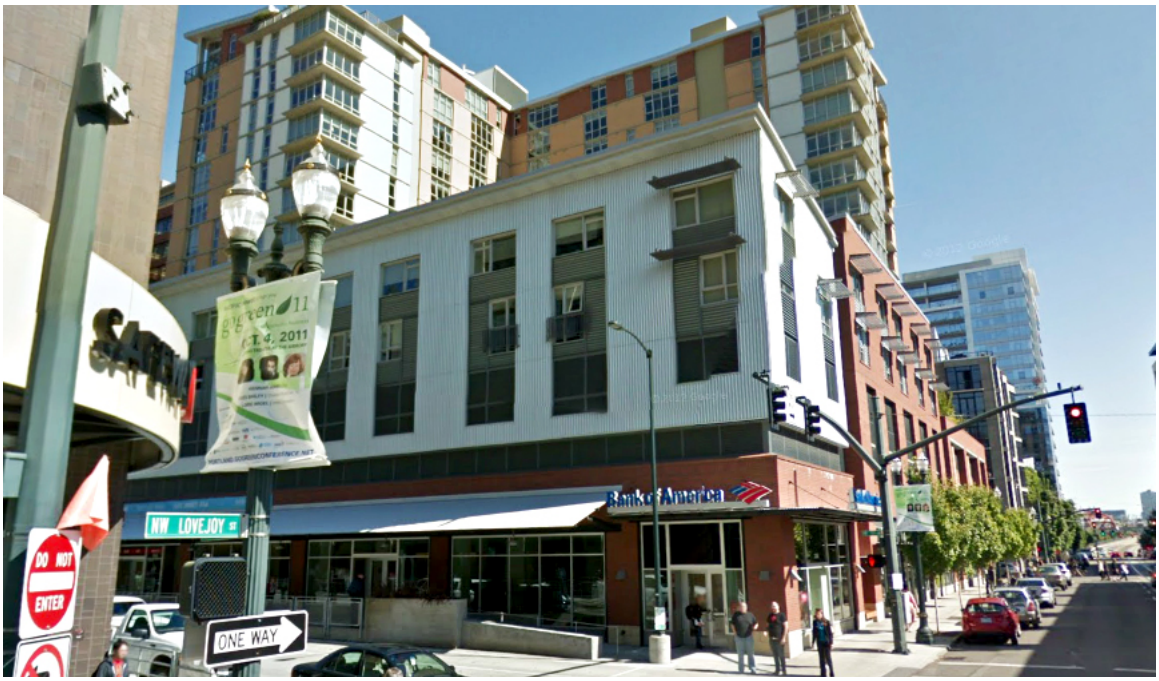

Figure 34: NPD Corner Banks

Second, the development pattern of street level active uses are mostly liner: only one or two street along transit stations are dedicated to retail or service uses; places beyond that suddenly turn to quiet residential neighborhood or offices again. Among the three sites, NPD in Portland has more plane type street level active uses instead of liner type. From Figure 13 (Current Land Use of NPD, Page 74), we can observe that the ground level retail or service uses cover almost three parallel streets in NPD. These differences bring up the question of which mixing type is better: only mix on the major thoroughfare or along the public transit stations, or should mixed uses be deep inside of neighborhoods? The former separates public and private areas better, but still keeps the convenience of mixed-use environment; the later provides more vivacious streets, but at the same time generates more conflicts between residential and commercial uses. There is no answer for how to mix better, but I think it is a question worth thinking about.

Third, talking about ground level or sidewalk design, I found that the "numbers" of certain percentages that should be built on the street line and the specific percentages of walls that should be transparent are not critical for shaping ground level designs. This is because the builders usually did more than the rules' requirements. From my point of view, those rules by themselves are indeed helpful for creating pedestrian friendly environments.

Finally, both FCN and NPD require separated pedestrian accesses of residential and other uses which is a special attribute of MXDs, but is usually ignored in traditional land use and development regulations.[174] However, because of the lack of information (I couldn't find building plans to analysis pedestrian circulations), the effect of these rule

[174] City of Vancouver, *Zoning and Development By-law*, "CD-1(324) 800-1100 Pacific Boulevard By-law No. 7248," November 30, 1993 (Vancouver, 1993); and City of Portland, *Municipal Code*, "Title 33 Planning and Zoning, Chapter 33.510 Central City Plan District, 33.140.265 Residential Development " (Portland: 2010)

are unclear; it is still worth it to know that these kinds of rules can be addressed in regulations.

4.2.3.Open Space Rules

Open spaces are more in demand and more necessary in MXDs. They address the needs of people who live in apartments and don't have their own courtyards, especially families with children, or those who work in isolated in live-work units. They provide opportunities for physical activities and casual interactions with others.

The following three figures (Figures 35 to 37) show the open space distribution of some residential parts of the three sites. I clipped the aerial views of them and then emphasized the green color in Photoshop to show their open space distributions and quantities. The three figures are in the same scale for comparison. It is interesting that although the three sites have similar geographic conditions, their approaches to open spaces are very different. NPD has distinct private or semi-private pocket parks; SLU has very green streets; FCN has large waterfront open spaces and some private or semi-private parks.

Figure 35: NPD Open Spaces Aerial View

Figure 36: SLU Open Spaces Aerial View

Figure 37: FCN Open Spaces Aerial View

In NPD, Portland, there are three major components that structure the open space system. The first one is the Open Space zoning district, which usually covers an entire 200 by 200 feet block. These kinds of open spaces are public. Second, in NPD the open space requirement for sites over 40,000 square feet say that a minimum of 30 percent of the area over 40,000 square feet must be devoted to open areas.[175] I think the semi-private type open spaces in NPD are mostly the result of this rule, with the combination of zero setback lines requirements (the requirement of building on the street property line) talked in the section of Ground Level Land Use and Design Rules. Third, the floor area bonus for rooftop gardens: for each square foot of rooftop garden area, a bonus of one square foot of additional floor area is earned; and the rooftop garden must

[175] City of Portland, *Municipal Code*, "Title 33 Planning and Zoning, Chapter 33.510 Central City Plan District, 33.510.225 Additional Standards in the North Pearl Subarea" (Portland: 2010)

cover at least 50 percent of the roof area of the building and at least 30 percent of the garden area must contain plants.[176]

The open space system in SLU, Seattle is also distinguished by three factors. First is the public block-size parks. There are two of this kind of parks in SLU (Figure 15, Page 78) and the sites around them are restricted by the upper-level setback requirements in Seattle's land use code. These requirements ensure that open spaces can receive abundant sunlight (the yellow strips above the buildings Figure 14, Page 77).[177] Second, there are requirements for 3 feet high screening on street property lines. The screening may be a fence or wall, or a hedge or landscaped berm, and street trees shall be provided in all planting strips.[178] Although street trees are not "open spaces" by themselves, they may be helpful to improve the quality of sidewalks and other types of open spaces. Third, bonus residential floor area for amenities: the bonus ratios are (7:1) for a neighborhood open space, (5:1) for a green street setback, (7:1) for a mid-block corridor and (5:1) for a residential hillside terrace.[179] The ratios mean, for example, for a neighborhood open space, 7 square feet of bonus residential floor area is earned for 1 square foot of qualifying neighborhood open space area.

As we discussed in the previous section, the entire set of FCN's regulations is the product of private and public sectors' cooperation, as is its park system. There are four major components of FCN's park system: the large waterfront parks and the continuous

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176 City of Portland, *Municipal Code*, "Title 33 Planning and Zoning, Chapter 33.510 Central City Plan District, 33.510.210 Floor Area and height Bonus Options " (Portland: 2010)

177 City of Seattle, *Municipal Code*, "Title 23 Land Use Code, Chapter 23.48 Seattle Mixed, 23.48.012 Upper-level Setback Requirements," (Seattle, 2005)

178 City of Seattle, *Municipal Code*, "Title 23 Land Use Code, Chapter 23.48 Seattle Mixed, 23.48.024 Screening and Landscaping Standards," (Seattle, 2011)

179 City of Seattle, *Municipal Code*, "Title 23 Land Use Code, Chapter 23.58A Incentive Provisions, 23.58A.016 Bonus Residential Floor Area for Amenities," (Seattle, 2011)

walkways that are governed in the FCN official development plan (Figure 38 and 39);[180] the semi-private open spaces and green roofs that are governed in the design guidelines (Figure 40).[181] Additionally, there are detailed design guidelines for semi-private open spaces, but for green roofs the design guidelines just suggest incorporating them where appropriate.[182]

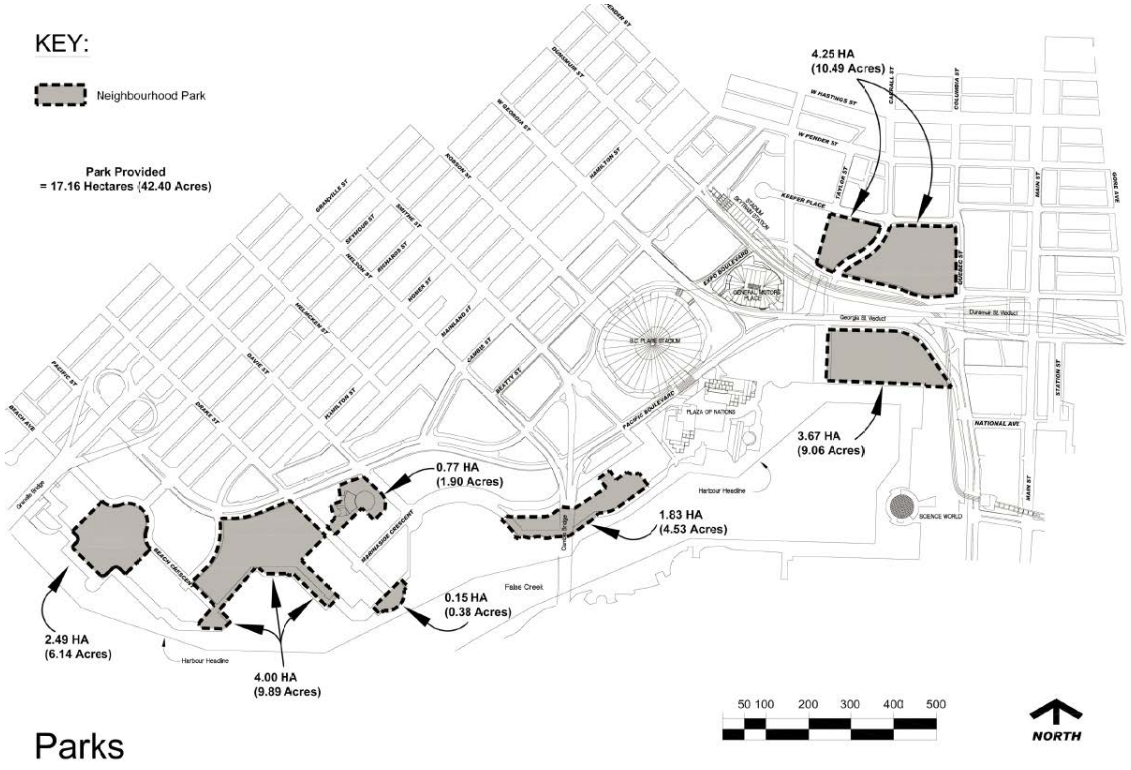

Figure 38: FCN Park Rules in FCN Official Development Plan[183]

[180] City of Vancouver, *False Creek North Official Development Plan,* Adopted by By-law No. 6650, April 10, 1990 (Vancouver, 1990)

[181] City of Vancouver, *Land Use and Development Policies and Guidelines,* "Beach Neighborhood CD-1 Guidelines (CD-1 No.366)," (Vancouver, 2002)

[182] Ibid

[183] City of Vancouver, *False Creek North Official Development Plan,* Adopted by By-law No. 6650, April 10, 1990 (Vancouver, 1990), 23

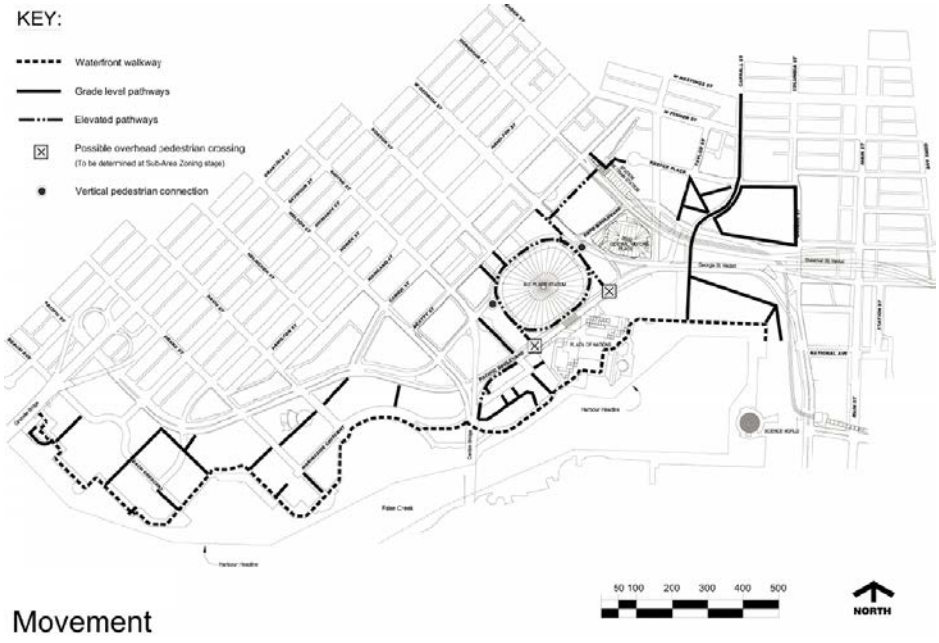

Figure 39: FCN Walkway Rules in FCN Official Development Plan[184]

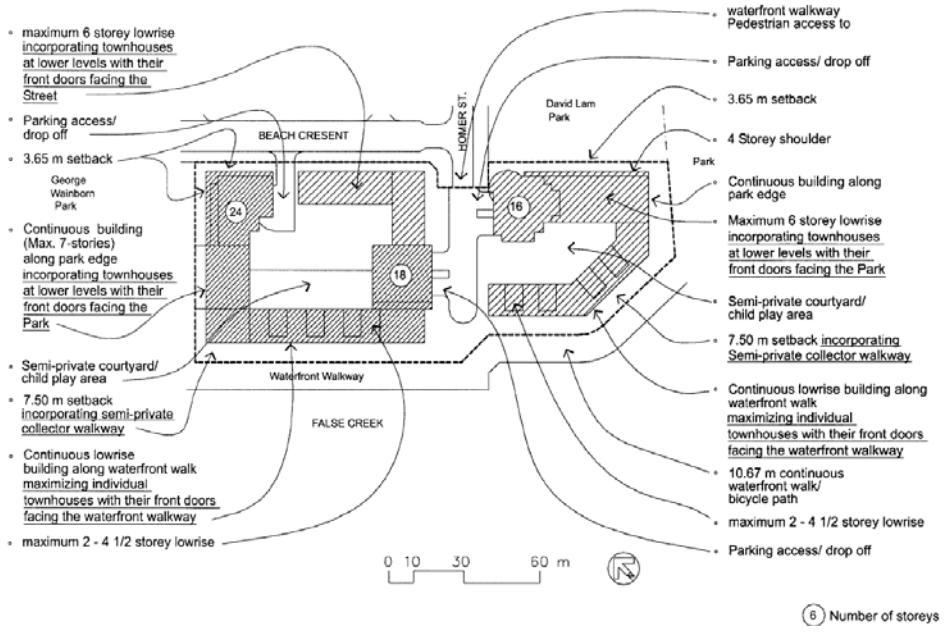

Figure 40: FCN Semi-private Parks Rules in Neighborhood Design Guidelines[185]

184 City of Vancouver, *False Creek North Official Development Plan,* Adopted by By-law No. 6650, April 10, 1990 (Vancouver, 1990), 27

185 City of Vancouver, *Land Use and Development Policies and Guidelines,* "Beach Neighborhood CD-1 Guidelines (CD-1 No.366)," (Vancouver, 2002), 11

From these observations and analysis of the open-space rules and current situations, I reaffirmed the power and influence of regulations. Through the open spaces aerial views of the three sites (Figure 35-37, Page 99-100), I first observed the distinct semi-private courtyards of NPD, the lush street trees of SLU and the very open water-front park of FCN. After I studied the open-space rules of each case study site, I found that all of these features didn't appear by chance. They are apparently the result of their regulations (Table 9 summarizes the open space rules of the three sites). It is worth noting that different codes of one place may work together to create some effects of the built environment. For example, the semi-private parks of NPD are the product of both the building line requirement and the open space requirement: without the open space requirement, there may be no on open spaces at all, and without the building line requirement, the open spaces may be located outside of the buildings.

As I mentioned in the first paragraph of this section and discussed in the literature review, open spaces are particularly important for families with children who live in a mixed-use site. Safe open spaces for children can attract families with children to live there, and further make the population component more diverse in the mixed-use site. Among the three case study sites, only FCN mentions the location of children's playgrounds in its' design guidelines. For my point of view, regarding the nature of mixed-use development, the design of open spaces or circulations for different groups of people, such as children and elders, has to be considered much more in the regulations.

	Rule	Rule Type
NPD, Portland	Open Space zoning district	Mandatory
	Open space requirement for sites over 40,000 Sq Ft	Mandatory
	Rooftop garden bonus floor area	Incentive
SLU, Seattle	City designated parks	Mandatory
	The requirement of three feet high screening on street property lines	Mandatory
	Bonus residential floor area for amenities	Incentive
FCN, Vancouver	Large waterfront parks	Mandatory
	Continuous greenways	Mandatory
	Semi-private open spaces	Interpretive
	Green roofs	Interpretive

Table 9: Open Space Rules of the Three Case Study Sites

4.2.4.Other Mixed-Use Developments Related Rules

General land use and design rules, ground floor uses and design rules and the open spaces rules of the three mixed-use sites have been discussed earlier. In the following paragraphs, I am going to briefly talk about more rules related to MXDs, including live-work rules, nuisance control rules, parking rules and affordable housing rules.

1) Live-work Rules

"Live-work unit" means a household unit that combines the function of living and working together, which is the "ultimate" type of mixed-use development. Common examples include artist studios, the offices of freelancers, and beauty salons. A live-work unit provides flexibility for the usages of structures, and at the same time, it provides economic opportunities for families by allowing the parents to work and take care of their children at the same time. Because live-work units are usually located in or near residential uses, cities may have some rules to regulate the usages of live-work units to prevent negative impacts to their neighbors.

NPD, Portland, has no codes regarding live-work units. In SLU, Seattle, live-work units are usually permitted outright in many zoning districts, such as Seattle Mixed, Commercial and Multi-family[186] In Seattle, live-work units are deemed nonresidential uses,[187] whereas commercial or manufacturing activity conducted is subject to a valid business license associated with the premises.[188] In some zoning districts, the locations of live-work units are required to be along the streets.[189] In FCN, the codes of live-work

[186] City of Seattle, *Municipal Code*, "Title 23 Land Use Code" (Seattle)
[187] City of Seattle, *Municipal Code*, "Title 23 Land Use Code, Chapter 23.42 General Use Provisions, 23.42.106 Expansion of nonconforming uses," (Seattle, 2011)
[188] City of Seattle, *Municipal Code*, "Title 23 Land Use Code, Chapter 23.84A Definitions" (Seattle, 2012)
[189] City of Seattle, *Municipal Code*, "Title 23 Land Use Code, Chapter 23.47A Commercial," (Seattle, 2012)

units are stated in each zoning by-law. For example in the Comprehensive Development Zone (324), the zoning by-law states the permitted location (having access to grade at Pacific Boulevard or Cooper Mews) and amount (788 square meters) of live-work units within the zone.[190] There is also another document called "Live-work Guideline" explaining the codes related to live-work units for the City of Vancouver.

2) Nuisance Rules

As discussed in the literature review section, one of the major issues of MXDs is the negative externality from commercial or other uses, which may impact the living quality of residential units. Since nuisance is one of the problems that traditional zoning has tried to solve, it is common to see smoke, noise and light control rules in land use and development codes. All of the three case study cities have some codes about nuisance control; here, I will introduce some innovative ways to control negative externalities. In the Chapter of Central City Plan District in Portland's Planning and Zoning Regulations, there is a rule called "Good Neighbor Agreement" which is for managing the impact of major event entertainment or commercial outdoor recreation uses in Open Space Zoning District to prevent the possible impact on nearby residents and businesses. The elements of a Good Neighbor Agreement include holding a Good Neighbor Agreement meeting with its' neighbors and having a complete management plan for the possible impact from the event (such as event schedule, noise management, litter management and so on). This Good Neighbor Agreement is required for the owner or operator of the major event entertainment or commercial outdoor recreation use before a building permit

[190] City of Vancouver, *Zoning and Development By-law,* "CD-1(324) 800-1100 Pacific Boulevard By-law No. 7248," November 30, 1993 (Vancouver, 1993)

is issued.[191] From my point of view, the most important merit of this Agreement is that it provides an autonomic way to rule events' impacts in a mixed-use neighborhood.

3) Parking Rules

MXDs contain different uses on one site, which may increase the construction costs because of the different needs of various uses. On the other hand, some of the needs of the uses may be complementary. For example, usually, the peak hours of residential and office parking are opposite. Therefore, in order to encourage MXDs by mitigating the construction costs and use resources efficiently by reflecting the nature of MXDs, regulations should consider the possible overlapping requirements of parking.

In Portland, there are "joint use parking" rules which allow the joint use of required parking spaces for two or more uses sharing the same parking spaces. This is because their parking demands occur at different times. This joint use of required parking is allowed by application. The documentation of the application should involve the number of parking spaces being shared and the analysis showing the anticipated parking demands on different times.[192]

In Seattle, there are "shared parking" codes addressing the exact combination of uses and their maximum shared parking percentages. Although shared parking in Seattle doesn't require the process of application, a shared parking "agreement" executed by the parties involved must be filed. There are two types of shared parking: shared parking for different categories of uses and shared parking for uses with different hours of operation. For the former one, there are two major categories: office uses and residential uses; each of them has a list of allowed sharing parking uses. Up to 50

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[191] City of Portland, *Municipal Code*, "Title 33 Planning and Zoning, Chapter 33.510 Central City Plan District" (Portland: 2010), 510-6

[192] City of Portland, *Municipal Code*, "Title 33 Planning and Zoning, Chapter 33.266 Parking and Loading " (Portland: 2010)

percent of residential parking lots can be reduced by this rule. For the later one, there are a list of "day time uses" and a list of "nighttime or Sunday uses" and up to 90 percent of parking requirement can be shared between the opposite categories.[193]

In Vancouver, there is no this kind of sharing parking rules; instead, in their Parking By-laws, it even states that if a development contains parking for more than one use, the total number of parking spaces shall be the sum of all of the parking requirements of different uses unless otherwise permitted by the Director of Planning.[194]

4) Affordable Housing Rules

Emily Talen has pointed out that "socially" mixed is an critical character to improve social equity and other qualities of mixed-use neighborhood.[195] In addition, in MXDs, there is usually the issue of gentrification: new high-end apartments or condominiums displace the original, but poorer, residents. The policy and regulations of affordable housing or social housing are the central approaches to realizing a socially mixed environment and protecting rights of people who already lived there.

In NPD, Portland, there are two bonus floor area options regarding to affordable housing: middle-income housing bonus option and Affordable Housing Replacement Fund (AHRF) bonus option. The former one means each square foot of certified middle-income housing, 3 square feet of bonus floor area is earned. Middle-income housing includes rental units and units for sale; both of them should be affordable to those earning no more than 150 percent of the area median family income, at least for 60

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193 City of Seattle, *Municipal Code*, "Title 23 Land Use Code, Chapter 23.54 Quantity and Design Standards for Access, Off-street Parking, and Solid Waste Storage, 23.54.020 Parking quantity exceptions," (Seattle, 2012)

194 City of Vancouver, *Parking By-law*, "Section 4. Off Street Parking Space Regulations," (Vancouver, 2009)

195 Emily Talen, *Design for Diversity: Exploring Socially Mixed Neighborhood*, (Amsterdam; Boston; London : Architectural Press, 2008)

years for rental units. The later one means the developer can contribute a certain amount of money to AHRF for earning bonus floor areas. For each $19.90 contributed to AHRF, one square foot of bonus floor area is earned. The funds may be used only within the Central City plan district, either for acquisition, remodeling or construction of housing affordable to those households earning no more than 60 percent of area median income.[196]

In SLU, Seattle, there is no area specifically dedicated to affordable housing. But, in Seattle, they do have some incentives for affordable housing. Generally, constructors can get bonus residential floor area by building affordable housing (each square feet of affordable housing earns around 4.7 square feet bonus floor area) or making a payment in lieu ($18.94 per square feet of net bonus residential floor area). Those affordable housing should serve only households with incomes no higher than 50% of median income for at least 50 years.[197]

In FCN, Vancouver, the False Creek North Official Development Plan requires 12.53 percent of the total number of dwelling units designated for affordable housing, with 50 percent of the affordable units to be suitable for households with children.[198] The number of 12.53 percent affordable housing is a negotiated agreement between the government of Vancouver and the developer of FCN.[199] However, in Vancouver's Zoning & Development Bylaws, I couldn't find a definition of "affordable housing," so it is not clear what group of people those housing units are designed for.

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196 City of Portland, *Municipal Code*, "Title 33 Planning and Zoning, Chapter 33.510 Central City Plan District" (Portland: 2010), 510-37 to 510-38

197 City of Seattle, *Municipal Code*, "Title 23 Land Use Code, Chapter 23.58A Incentive Provisions, 23.58A.014 Bonus residential floor area for affordable housing," (Seattle, 2011)

198 City of Vancouver. *False Creek North Official Development Plan*, Adopted by By-law No. 6650, April 10, 1990 (Vancouver, 1990), 8

199 John Punter, *The Vancouver Achievement- Urban Planning and Design* (Vancouver: UBC Press, 2003), 187-218

Chapter V: Conclusion

This PR explored the inherent issues of residential and commercial uses in mixed-use developments. In Chapter II, the distinguishing characteristics of mixed use have been discussed; the methodology for the case studies is described in Chapter III. Then in Chapter IV, the regulatory effects of the three case-study sites are analyzed.

Generally, among the three sites, NPD, Portland has the most mixed land uses- the employment uses and residential uses are very close, and ground floor commercial with housing uses above were very common. NPD is very mixed in terms of horizontal, shared premise, or time. I believe this mixed character also contributes to its low percentage of vehicle ownership (Figure 41). In the Zip Code district of NPD (which covers NPD and its surrounding areas), in both 2000 and 2011, more than 40 percent of households don't have a car. The households' economic status may be a reason, but on the other hand, it may be that the highly mixed land uses and good public transportation systems make it unnecessary for the households to own a car.

The household density of NPD also has increased the most among the three sites in recent years, which has gone from 4.42 to 7.45 household units per acre. The numbers show people's preference for NPD, a mixed and rather dense neighborhood. Although, comparing to SLU and FCN, the average household size is the smallest and the household type diversity is the least (most of the households in NPD are one-person households), indicating family-type households don't favor NPD very much. But, based on the analysis in Chapter IV and the statistical data mentioned above, I think the regulations and policies of mixed-use developments in NPD have been successful. They promote residential uses, particularly in this former industrial and commercial site, by floor area bonuses. They allow dense developments up to a maximum height of 100

feet, with the floor area ratio of 9:1. They have also legalized land use plans which further take account transportation plans.

Similar to NPD, SLU in Seattle was a neighborhood mainly comprised of industrial and commercial uses. But in contrast with NPD, the mixed-use regulations of SLU focus on employment uses such as office, industrial, and research, rather than residential uses. They do encourage residential uses in some sites (such as SM/R) by allowing higher maximum height, but there are more rules that provide extra maximum heights for research and development laboratory uses. From 2000 to 2011, the household units per acre went from 3.63 to 4.8, while the average household sizes remained at approximately 1.6 people. This indicates that people are moving into SLU during this decade, implying that people like this mixed-use neighborhood (Figure 41). In general, SLU looks like it is still in transition from a warehouse district to a mixed-use neighborhood with innovative firms: some places were old warehouses and some were still under construction in 2011 based on Google Street View.

As opposed to the more commercial-oriented NPD and SLU, most of the areas in FCN, Vancouver were designated as open spaces and residential uses. From Figure 41, we can observe that among the three sites FCN has the largest average household size (1.64 people in 2006 and 1.9 people in 2001) as well as the greatest household type diversity. These numbers imply that families may prefer to live in FCN, a mixed and high-rise neighborhood. I think it is the result of the City of Vancouver's special attention to housing for families with children. For example, in some design guidelines of FCN, there are open spaces designated as kids' playgrounds. There is also a document called *High-density Housing for Families with Children Guidelines,* which mentions the issues of children's playground, surrounding land uses, pedestrians'

circulation and other topics regarding spaces for children.[200] While I think attracting families, especially families with children, to a mixed, high-rise environment is not as easy as it is to attract them to other types of households, I think the FCN did well in this. Furthermore, it is interesting that although the development in FCN looks very dense because of those high-rise buildings, the actual household units per acre of it is very low: only 0.75 unit/acre in 2006 and 0.95 units/acre in 2011. The low density of FCN isn't the result of low occupancy rate - the occupancy rates of it were high, especially in 2011 was 94%.[201] The low household density is the result of the large open spaces in FCN.

Aside from the rather high average household size, FCN's existing land uses look the most alike to its zoning map- the land uses highly correspond to its zoning rules. This is because the permitted land uses, their density, location and other restrictions were decided on through cooperation and negotiation between public and private sectors.[202] This developer was expected to pay all the costs of city's planning and regulatory work, thus allowing the creation of a team of city officers to work across developments alongside the developers and their designers.[203] This collaborative and corporate planning between private and public entities is very unique. If we consider a successful mixed-use development by the degree of how does it following plans and regulations, FCN is very successful.

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200 City of Vancouver, *High-density Housing for Families with Children Guidelines*, March 24, 199s (Vancouver, 1992)

201 Planed total household units in FCN is 10154 based on City of Vancouver, *False Creek North Official Development Plan*, Adopted by By-law No. 6650, April 10, 1990 (Vancouver, 1990), 21; 2011 actual household number is 9588 based on: Statistics Canada. 2012. GeoSearch. 2011 Census. Statistics Canada Catalogue no. 92-142-XWE. Ottawa, Ontario. Data updated October 24, 2012. http://geodepot.statcan.gc.ca/GeoSearch2011-GeoRecherche2011/GeoSearch2011-GeoRecherche2011.jsp?lang=E&otherLang=F (accessed 2013-05-23)

202 Punter John, The Vancouver Achievement- Urban Planning and Design

203 Ibid

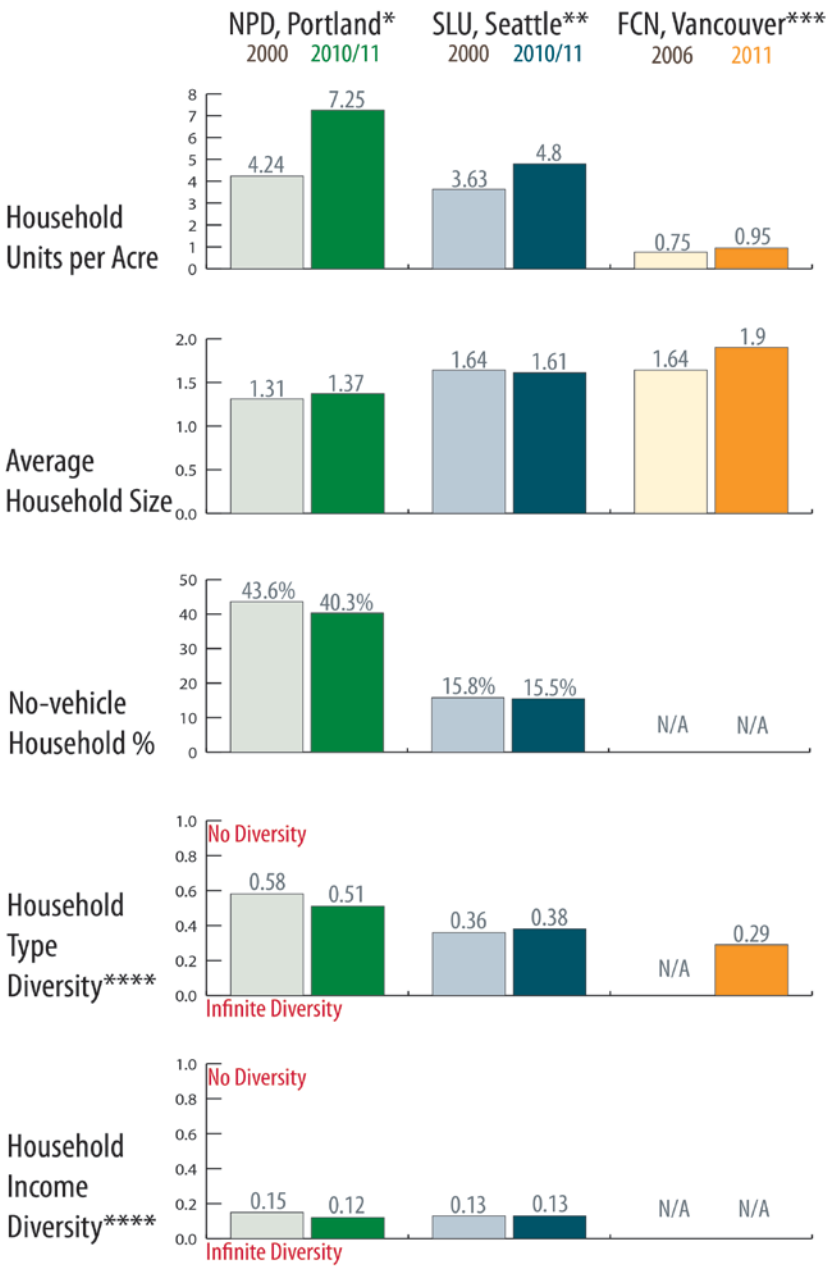

Figure 41: Census Data of the Three Sites[204]

204 *NPD, Portland Data Sources: **HH Units per Acre 2000**: U.S. Census Bureau, Census 2000 Summary File 1, Matrices P1, P3, P4, P8, P9, P12, P13, P,17, P18, P19, P20, P23, P27, P28, P33, PCT5, PCT8, PCT11, PCT15, H1, H3, H4, H5, H11, and H12; **HH Units per Acre 2010**: U.S. Census Bureau, 2010 Census; **Average HH Size 2000**: Census Bureau, Census 2000 Summary File 1, Matrices P1, P3, P4, P8, P9, P12, P13, P,17, P18, P19, P20, P23, P27, P28, P33, PCT5, PCT8, PCT11, PCT15, H1, H3, H4, H5,

H11, and H12; **Average HH Size 2010**: U.S. Census Bureau, 2010 Census; **No-vehicle HH % 2000**: U.S. Census Bureau, Census 2000 Summary File 3, Matrices H1, H7, H20, H23, H24, H30, H34, H38, H40, H43, H44, H48, H51, H62, H63, H69, H74, H76, H90, H91, and H94; **No-vehicle HH % 2011**: U.S. Census Bureau, 2007-2011 American Community Survey; **HH Type Diversity 2000**: U.S. Census Bureau, Census 2000 Summary File 1, Matrices P1, P3, P4, P8, P9, P12, P13, P,17, P18, P19, P20, P23, P27, P28, P33, PCT5, PCT8, PCT11, PCT15, H1, H3, H4, H5, H11, and H12; **HH Type Diversity 2010**: U.S. Census Bureau, 2010 Census; **HH Income Diversity 2000**: U.S. Census Bureau, Census 2000 Summary File 3, Matrices P30, P32, P33, P43, P46, P49, P50, P51, P52, P53, P58, P62, P63, P64, P65, P67, P71, P72, P73, P74, P76, P77, P82, P87, P90, PCT47, PCT52, and PCT53; **HH Income Diversity 2011**: U.S. Census Bureau, 2007-2011 American Community Survey. **SLU, Seattle Data Sources: **HH Units per Acre 2000**: U.S. Census Bureau, 2000 Census; **HH Units per Acre 2010**: U.S. Census Bureau, 2010 Census; **Average HH Size 2000**: U.S. Census Bureau, 2000 Census; **Average HH Size 2010**: U.S. Census Bureau, 2010 Census; **No-vehicle HH % 2000**: U.S. Census Bureau, Census 2000 Summary File 3, Matrices H1, H7, H20, H23, H24, H30, H34, H38, H40, H43, H44, H48, H51, H62, H63, H69, H74, H76, H90, H91, and H94; **No-vehicle HH % 2011**: U.S. Census Bureau, 2007-2011 American Community Survey; **HH Type Diversity 2000**: U.S. Census Bureau, 2000 Census; **HH Type Diversity 2010**: U.S. Census Bureau, 2010 Census; **HH Income Diversity 2000**: U.S. Census Bureau, Census 2000 Summary File 3, Matrices P30, P32, P33, P43, P46, P49, P50, P51, P52, P53, P58, P62, P63, P64, P65, P67, P71, P72, P73, P74, P76, P77, P82, P87, P90, PCT47, PCT52, and PCT53 ; **HH Income Diversity 2011**: U.S. Census Bureau, 2007-2011 American Community Survey. ***FCN, Vancouver Data Sources: **2006**: Statistics Canada. 2012. GeoSearch. 2006; **2011**: Statistics Canada. 2012. GeoSearch. 2011 Census. Statistics Canada Catalogue no. 92-142-XWE. Ottawa, Ontario. Data updated October 24, 2012. **** Household Type Diversity and Household Income Diversity are calculated by Simpson Diversity which is usually used for measuring biodiversity of a habitat. In *Design for Diversity*, Talen uses the function to calculate income, racial, age and family diversity in her researching area. Simpson Diversity Index ranges from 0 to 1. Generally the smaller of the index means the larger diversity and the larger social diversity represent a equal, stable and creative community. The function of Simpson Diversity Index is $D= [\sum n(n-1)]/N(N-1)$. D=diversity, n= the total number of households of a particular income household type group, N= the total number of households of all groups.

Besides the conclusions for each of the sites, in the following more synthesized conclusions are provided. First of all, all of the three sites have some kinds of *mixed-use zoning districts*. Single use zoning districts are different from mixed-use zoning districts, which usually allow a wide range of permitted uses. However, from the case studies, we can find there are basically two things that help shape mixed-use zoning districts. The first one is incentive programs: NPD has incentive floor area ratios for residential use and other amenities, while SLU has incentivized laboratory and research uses using extra maximum building heights. The second one is by legalizing plan districts such as FCN, municipalities can negotiate the exact amounts or percentages of each land use with developers. These incentives and plan districts can help cities to promote certain qualities in mixed-use zoning districts.

Other than FCN, NPD also has legalized *plan districts* which are very helpful for connecting interpretive planning to legalized zoning and development regulations. Most importantly, plan districts provide clear and localized rules for comprehensive policies (such as housing and transportation) with specific intentions for each rule. Mixed-use neighborhoods are more unpredictable and ambiguous; nevertheless, with the help of plan districts, municipalities can have clear vision for them, and developers and other stakeholders will have a clear set of rules to follow.

The other finding from the case studies is generally that none of the sites have enough rules regarding *circulation*. In mixed-use environments, there are different groups of people moving with different purposes and needs: residents want to walk home safely and privately, workers need spaces to hang out with their coworkers, companies want to have grand entrances, retailers and restaurants need both obvious entrances and convenient loading spaces. Among the three sites, only FCN and NPD have addressed

these requirements of separated pedestrian accesses for residential and other uses; however neither of them has detailed rules for it. To deal with the issue of circulation, form based codes may be a good solution, if the codes take the needs of different uses into account. Furthermore, from an urban design point of view, I would suggest separating the ground and upper level regulations, or providing much more detailed ground level rules, in order to provide better urban experiences for all groups of people.

Mixed-use developments are not only for mixing "uses" but also for *mixing different groups of people* by providing supportive urban settings for people with diverse ages, incomes and family types. Socially mixed neighborhoods are beneficial for the whole society in two ways: 1) they ensure better access to resources for all social groups; and 2) mixing population groups is the ultimate basis of a better, more creative, more tolerant, more peaceful and stable world.[205] I believe that to achieve the goal of socially mixed mixed-use developments, the land developing rules should actually take the needs of different groups of people into consideration.

Finally, the case studies reaffirm my thoughts on the power of regulation. From land uses to the distribution of open spaces, all of the results can be explained by some related codes. In *City Rules*, Emily Talen said *"Through their manipulation of pattern, use and form, rules have a strong impact on quality of life, affecting everything from patterns of daily life [...]to who lives next to whom."*[206] Furthermore, I believe that mixed-use developments need more subtle regulations from the government in order to coordinate the developers' economic interest and social welfare as a whole.

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